

MULTIMEDIA

B.Com VI Semester

(Computer Science)

As Per Syllabus of Vijayanagara Sri Krishnadevaraya University, Bellary

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A Complete Reference Material for

B.Com VI Semester, Computer Science

SYLLABUS

PAPER 6.6 MULTIMEDIA (B.Com VI Semester - Computer Science)

Unit I – Introduction to Multimedia :

Elements of Multimedia, Growth of Multimedia, Major categories of Multimedia and other categories of Multimedia.

Unit II – Multimedia Tools :

Hardware components of multimedia system, Multimedia elements; Texts and Graphics, Sound, Animation and Video, Multimedia authoring programs, Delivering multimedia.

Unit III – Developing Multimedia :

Developing Multimedia Titles, Steps in developing interactive multimedia, The planning phase, the creating phase, the testing phase.

Unit IV – Designing Multimedia :

Designing for multimedia, Basic design principles, Design for interactivity, Guidelines for interactive design, Producing and distributing multimedia; Producing multimedia titles, distributing multimedia titles.

Unit V – Multimedia Issues and Future of Multimedia :

The internet and World Wide Web, Issues and trends in Multimedia.

Practicals : 2 hours per week

20 Simple assignments for Multimedia programming using suitable software shall be implemented.

Recommended Books :

1. Shuman James .E, Multimedia in Action, Thomson Learning – Vikas Publishing House (2001)
2. FrankinKuo, Wolfgang and JJ Garsia, Multimedia Communications, Protocols and Applications, Prentice Hall PTR (1998)
3. Fred T Hofstetter, Multimedia Literacy, 3rd Edition, Tata McGraw Hill (2001)
4. Rao, Bojkovic and Milovanoviv, Multimedia Communication Systems, Pearson Education (2002)

UNIT I – INTRODUCTION TO MULTIMEDIA

Introduction :

Fundamental to the development and delivery of multimedia is a computer capable of incorporating various elements, such as sound, animation, and providing an environment in which the user can interact with the program.

Definition :

Multimedia can be defined as a computer based interactive communication process that incorporates text, graphics, sound, animation and video.

The ability of the user to interact with the program is perhaps the single most critical features of multimedia. A movie is an examples of a medium that combines numerous elements such as graphics, sound and animation. But a movie is presented in a linear way. It is passive or non-interactive. The viewer has little control over how the content is presented. Multimedia, on the other hand, allows the content to be presented in a nonlinear way, with the user being active rather than passive. Thus, it is interactive.

Benefits of Multimedia

1. Deeper understanding :

According to research, a benefit of multimedia learning is that it takes advantage of the brain's ability to make connections between verbal and visual representations of content, leading to a deeper understanding, which in turn supports the transfer of learning to other situations. All of this is important in today's 21st century classrooms, as we are preparing students for a future where higher-level thinking, problem solving and collaborative skills will be required.

2. Improved Problem Solving :

A large percentage of the human brain dedicates itself to visual processing. Thus, using images, video and animations alongside a text stimulates the brain. Student attention and retention increase. Under these circumstances, in a multimedia learning environment, students can identify and solve problems more easily compared to the scenario where teaching is made possible only by textbooks.

3. Increased Positive Emotions :

According to psychologist Barbara Fredrickson, experiencing positive emotions makes people see more possibilities in their lives. Using multimedia during instructions impacts student's mood during the learning process. With a positive attitude they learn better and tend to be more proactive.

4. Access to vast variety of information :

With computers, tablets, smart phones and the internet, students are today better equipped than ever to search and find the information they need. A study revealed that 95% of students, who have access to internet, use it to search for online information. Sharing the information and participating in class discussions is done in a more confident way when access to information is as easy as today.

5. World Exploration :

There is no surprise here. With the help of multimedia children can explore and learn about places they would never been to. In a geography class, students can explore different cities of the world, the tallest mountains and the most dangerous jungles. In a science class, space and planets exploration is now possible. In a biology class, the dissection of rare animals and different habitats exploration are like a walk in a park for students benefiting of a multimedia learning environment.

Advantages of Multimedia

1. **Creativity** : It brings more life to discussions.
2. **Variety** : It caters all types of learners.
3. **Cost-effective** : Multimedia mostly requires only a one-time purchase of devices and software, which can be used unlimited times thereafter.
4. **Evaluation** : It offers ideal learning assessment tools which are also entertaining for the students.
5. **Realistic Approach** : It provides approaches which make learning more realistic.
6. **Wide Variety of Support** : Multiple media formats are available for use, with different models being able to create multimedia.
7. **Trendy** : The current trend of culture leans toward technology, and a great number of resources are being made available for different media formats.

Disadvantages of Multimedia

1. **Accessibility** : Multimedia requires electricity to be operated, which may not be available in some rural areas or may not be consistently available due to shortages and blackouts.
2. **Distracting** : Multimedia may take away the focus from the lesson due to its attention-grabbing formats.
3. **Costly** : Production of multimedia is more expensive than others because it is made up of more than one medium. Production of multimedia requires an electronic device, which may be relatively expensive. Multimedia requires electricity to run, which adds to the cost of its use.

4. **Time Consuming** : Creating multimedia requires more time.
5. **Requires Mastery** : Multimedia requires consistent and long practice to master, which may take a lot of time and energy from the user.
6. **Limited Support/Compatibility** : There is a wide variety of gadget models which arouses incompatibilities of media formats.
7. **Fragile** : The device used for multimedia must be used with care; exposure to moisture or other elements could cause expensive, irreparable damage which would require another purchase of a device.

THE ELEMENTS OF MULTIMEDIA

The multimedia is formed with the combination of five elements or components such as Text, Graphics, Sound, Video and Animation. These elements are used to create multimedia applications.

GROWTH OF MULTIMEDIA

One indication of phenomenal growth of multimedia is the number of households that own a multimedia computers, that is, a computer with a CD-ROM drive, audio card and speakers.

Another indication of the growth of the multimedia industry is the increase in the number of multimedia titles.

The reasons for the extraordinary growth of multimedia and can be looked at from a marketing and a user standpoint.

GROWTH FROM A MARKETING STANDPOINT

Price :

Economics tells us that as price declines, demand increases. Price of multimedia titles fell from an average of \$100 in 1992 to an average of \$30 in 1996. Similarly the price of new computers capable of playing CDs dropped from around \$2500 to less than \$1500. For people who owned a computer and wanted to upgrade it to play multimedia CD titles(CD-Rom drive, sound card and speakers) the price dropped from about \$1000 to less than \$300.

Hyper :

It is a situation in which something is advertised and discussed in newspapers or on television etc in order to attract everyone's interest. Graphic artists, instrumental designers, video producers, programmers & musicians began to learn the new technology that would drastically affect their profession. It is best suitable to use in training centers to teach.

Value added :

Most personal computers at work and home are used primarily for word processing, a huge improvement over the typewriter, but hardly the best use of the technology. Now, with an investment of a few hundred dollars, the computer can be changed into an entertainment center, educational resource, and marketing tool. Adding value to an existing product is a way to enhance its appeal.

GROWTH FROM A USER STANDPOINT**User Control :**

Multimedia empowers the user by giving the user control. And empowerment is motivating. No long must learning be someone lecturing at us in a mostly one way, passive process. No long are we constrained by the limitations of the printed page. No longer do we have to manipulate the VCR to find the desired video clip. The user decides what information to access, when to access it and the way it will be presented. The user decides if he or she needs to review once more or get additional help.

Individualization :

It is very closely associated with the user control that the ability of a multimedia title is to address different learning style & needs. One person may want to focus on listening skill while another may want to practice vocabulary. Another form of individualization is adjusting the level of difficulty based on user actions for example, playing video games.

Action :

Reading a book, listening to a lecture, and watching a videotape are somewhat passive processes. Using a computer to play a flight simulator game or dissecting a frog in a virtual lab are active process. Finally, you decide to test your knowledge of the passage by taking a quiz and getting immediate feedback. Based on the feedback, you decide to review the material again or go on to a new passage – an active process.

THE MAJOR CATEGORIES OF MULTIMEDIA TITLES

It is useful to distinguish between different categories of multimedia, because creating a multimedia title may depending on the category. For example, the use of animated cartoon characters might be appropriate for a multimedia game, but inappropriate for a marketing presentation.

• ENTERTAINMENT

Game developers were pioneers in the use of multimedia. The developer needs to attract, engage, captivate and challenge the graphics. Multimedia developers have taken the emphasis from pure action to action plus storytelling, from games to entertainment, from the physical to the mental. Multimedia can incorporate the fast action, vivid colors and 3-D

animations and elaborate sound effects that are essential in entertainment. It can also provide the rewards, recognition, and sense of accomplishment that are often a part of entertainment titles.

- **EDUCATION**

Multimedia facilitates learning – to help the student gain a knowledge, acquire specific skills and function successfully in society. Multimedia can accommodate different learning styles: some students learn better through association, others by experimentation; some are more visually oriented and other are more auditory. Multimedia can present the material in the way we think in a manner that is nonlinear. Multimedia will provide the feedback for the users, so that the user can adjust the level of difficulty and can evaluate the skills. Multimedia is used to produce computer based training courses, reference books like encyclopedia and is also used for modeling & simulation in scientific research.

- **MARKETING AND TRAINING**

The ultimate goal of a marketer is to sell a product, service or idea, usually through informing and persuading. The marketer must attract attention to a message. Multimedia can accomplish this through the use of sound, animation and graphics and addressing specific needs of a target audience. Companies now distribute their product catalogs on CD-ROM, allowing buyer to customize the product and then order. Touch screen kiosks are placed in shopping malls, retail stores and car dealerships. Home pages on the World Wide Web provide interactive, online shopping via the Internet.

- **PRESENTATION AND TRAINING**

Thousands of multimedia presentations are made in the business world every day. Company CEO gives the annual report to a meeting of stockholders. Sales reps pitch their product line to a group of potential customers. A conference keynote speaker tells an audience about industry trends. From an electronic slide show to an interactive video display, multimedia can enhance presentations. Multimedia gives the presenter a tool to attract and focus the audience attention. Another form of corporate communications involves training employees using multimedia-enhanced materials.

OTHER CATEGORIES OF MULTIMEDIA

- **EDUTAINMENT**

As the name suggests, **edutainment** is the combination of education and entertainment. It is very easy to attract the learners and the audience. It instructs the audience by embedding the lessons in form of entertainment such as television program, computer games. Many multimedia titles, especially children's games such as Math Blaster, fit this category.

- **TRAINING**

Multimedia titles that focus on developing specific skills usually related to a particular job are called training titles. The Boeing Company has an entire training division dedicated to developing multimedia titles that instruct mechanics and pilots on new aircraft systems. Holiday Inn uses a computer based interactive role playing game to improve customer service.

- **RECREATION**

It is proposed for use in community education environments, home school environments, traditional school environment or as a supplement & fun addition to any education program. Hobbies and sports are examples of the types of titles that could be classified as recreation. These often give the user a vicarious experience such as being able to play the most famous golf courses in the world or simulate flying over 3-D cityscapes.

UNIT II – MULTIMEDIA TOOLS

HARDWARE COMPONENTS OF MULTIMEDIA SYSTEM

THE PLAYBACK SYSTEM

Playback is a term used to describe media files that are accessed by a user after their initial creation. An example of playback is an audio or video file that is stored on the computer and can be opened at any time. The type of **Playback System** is related to the installed market, that is, the computers in use. When multimedia was developing in the 1980s, there were millions of desktop computers in businesses, homes and school.

The following are essential hardware components of playback system.

- **PROCESSOR :**

The type of processor determines, among other things, how quickly data is processed and transferred. This becomes critical as the multimedia title becomes more graphic intensive. The minimum specification of MPC at Level 2 standard is a 486SX 25 MHz processor. This configuration will provide optimal quality video, sound and graphics and smoother animation.

- **MEMORY :**

The two basic types of memory in a computer are temporary and permanent. The temporary memory, called RAM, is used to store instructions and data that are used while an application is running. When you turn off the computer when you are finished, the instructions are erased from the temporary memory.

The computer's hard drive is used to permanently store program instructions that are needed each time the program is run. This is called ROM. This memory stores the data permanently for the future use and can be accessed when it is necessary. CDs are available as ROM but you can erase programs from hard drives.

- **MONITOR AND VIDEO CARD :**

The monitor or display is critical in the playback system, because it provides the primary feedback to the user. Standards have been established for the screen resolution and the number of colors.

Screen resolution is measured in the number of dots displayed on the monitor. These dots are called pixels and are the smallest units a monitor can display. A standard resolution is 800 pixels across and 600 pixels down the screen. The number of pixels is determined by the video graphics adapter card and its memory capacity. For Windows based systems, the VGA (Video Graphics Array) cards support a resolution of 800X600, whereas the SVGA (Super VGA) cards can support much higher screen resolutions (1024X768 pixels).

The video card also determines the number of colors that can displayed on the screen and, the color quality. The more colors, the higher the image quality, each pixel can

display from one color to millions of colors. The number of colors is determined by information associated with the pixel. The information is coded in bits(binary digits). Let's say that you want to use 16 different colors in your graphics. Each pixel would need to be able to display each of the 16 different colors. Each color could be assigned a number from 0 to 15 (16 total colors). The following table shows the display resolution with number of colors.

Screen Size in Pixels	Color Depth in Bits	Number of Colors	Video Graphics Adapter
640 X 480	4	16	VGA or SVGA
640 X 480	8	256	SVGA
800 X 600	8	256	SVGA
1024 X 768	16	65,536	SVGA
1280 X 960	24	16.7 million	SVGA

- **AUDIO CARD :**

In order to incorporate sound, the computer needs an audio card, such as Sound Blaster, and speakers. Just as a video card is used to display digital images, an audio card used to play digital sounds. The number of bits used to represent a sound determines the quality of the sound. The standard is now 16 bit sound. In order to be played through a computer, sounds need to be digitized. The process, called sampling, changes an analog signal into a digital signal.

- **CD ROM DRIVE :**

CD-ROM stands for compact disc-read-only memory. A CD-ROM drive reads the data on the CD and transfers it to the computer. If the transfer time is too long, the user may get impatient. The CD-ROM drive determines the type of CD that can be played, the speed at which data is located on the CD, and the speed at which data is transferred from the disc to the computers. The data transfer rate is measured in kilobytes per second (Kbps). Now there are quad 4x, as well as 6x, 8x and even 12x speed drives with a transfer rate of 1800 Kbps. The seek time required to find a specific piece of data on the CD is measured in milliseconds (ms), that is, thousandths of a second. The Level 3 standard is 200ms.

THE DEVELOPMENT SYSTEM

Development system needs to be the fastest & most powerful and need to have largest storage capacity. By using the better tools in the development system, we can work quickly. In addition to the computer system, several related hardware components are needed in the process of development. In this system the software always allows a developer to choose platform for creating a multimedia title. It can lower the production costs by reducing the time of programmers, graphic artists and animators.

The following are essential hardware components of playback system.

- **PROCESSOR :**

The minimum specification a model would be 486D X 66 MHz unit for the development. A microprocessor is a particular implementation of processor which happens to fit in a single electronic component (chip).

A Macintosh System with a 68040 processor running at 33 MHz would be a minimum configuration with a Power Mac with more the 100 MHz being desirable.

- **MEMORY :**

Multimedia titles are extremely memory intensive. Therefore, 16 MB of RAM would be a minimum, with 32 or 64 recommended. Hard drive disk space is determined by the number of programs that need to store on the drive. It is common to use several programs to create a multimedia title, including drawing, authoring and image, sound and video edition. Minimum hard disk space would be 1 gigabyte (1 GB).

- **VIDEO CAPTURE CARD :**

If video is going to be used, it needs to be digitized using a video card. The card fits internally within the computer, and a video source (camera, VCR, TV, Videodisc) is plugged into the card. As the video signal is sent from the source, it is captured, digitized, and stored. Later it could be edited by deleting frames, adding text, adding sound, and so forth.

- **MONITOR :**

The developers need larger (20 inch) models of monitor. This allows them to enlarge an image for detailed editing and to use the monitor as you would a desktop, with several items displayed and available. Ideally, the developer would have two monitors, one that is used to work on the title, and another for displaying the title as it is being created.

- **PERIPHERALS :**

In addition to the basic computer system, other hardware called peripheral devices or peripheral may be needed when developing a multimedia title.

1. **SCANNER :**

A scanner is used to create digitized images so they can be incorporated into multimedia titles. Scanners are an excellent way to generate graphics from photographs, books, and artwork – essentially any printed material as well as any object that can be placed in a scanner. It vary in terms of configuration (flatbed, handheld, slide), quality (number of colors), editing features (such as adjusting color, contrast and brightness), and price.

2. EXTERNAL STORAGE :

Additional storage space to relieve the pressure on a computer's hard drive is provided by external storage devices. They can be used to back up data from the hard drive, which prevents accidental loss of work. They give needed portability when files must be transferred from one system another.

3. CD RECORDER :

As the price of CD recorders has dropped from \$10,000 to less than \$ 500, multimedia developers are using them in multiple ways. CD records can be used to create single CDs of products from testing, to generate finished CDs when only a few are required, to provide a way to deliver the files to a manufacturer for mass production, and to back up and archive data.

4. DIGITAL CAMERA :

A digital camera is used to capture still images just like a regular camera. After taking a picture, we can transfer it directly from the camera to the computer as a graphic image. Software that comes with the camera allows you to edit the image and save it as a graphic file.

5. MICROPHONE :

A microphone could be used to add narration, voice-overs, or sound effects to the title.

6. OTHER :

Depending on the elements to be incorporated into the multimedia title, other hardware components might include a video camera, a VCR, or a videodisc player.

MULTIMEDIA ELEMENTS

WORKING WITH TEXT :

Most computer users have had experience with word processing and are familiar with entering and editing text and working with fonts and point sizes. The following are some considerations and guidelines to keep in mind when working with text.

- **CONCISE :**

Reading volumes of text on a computer screen is difficult and tiring. It may not be the best way to communicate an idea, concept or even a fact. The saying "A picture is worth a thousand words" is as true in multimedia as on the printed page. There are certainly titles where text predominates, such as reference works like encyclopedias, combining other elements with text can often reduce the amount of text needed to convey a concept. From a design standpoint, text should fill less than half the screen.

- **APPROPRIATE FONTS :**

Huge, gray blocks of text can be boring to read. We can choose to enliven text by selecting typefaces, called fonts, and type sizes appropriate to the audience. Fonts are useful in focusing attention on certain text on the screen, enhancing readability, setting a tone and projecting an image.

Fonts can be characterized as Serif, Sans Serif and Decorative. A serif is a line or curve extending from the ends of a stroke of a character. The French word sans means without, so a sans serif typeface is one without serifs.

When choosing a font, always consider the objectives and the intended audience. If the objectives have to do with creating reference title such as the “Selected Works of Shakespeare” and the audience is college students, the title would be text intensive and part of the text, such as headings, might utilize a decorative font appropriate to Shakespeare’s time.

- **MAKE IT READABLE:**

The overriding concern with text is readability. Although a decorative font may be attractive, it may also be hard to read. Sans serif text is clean, simple and projects rationality and objectivity. Serifs create the illusion of a line along the base of a line of text and guide the eye across the screen, facilitating readability. Research has shown that comprehension of text blocks with serifs is 75 to 80 percent, whereas comprehension of text blocks set in sans serif typefaces is 20 to 30 percent. Serif text is described as old-fashioned, friendly, and easy to read. Sans serif text is described as clean, sleek, modern and not so easy to read. A sans serif font may be used for multimedia titles in which there is not much text, such as a game.

Font are measured in point sizes. There are 72 points per inch. Ten and 12 point are common sizes for type displayed on the screen. The size often depends on the application. Suggested guidelines are as follows.

Headings 14 to 18 point

Subheadings Half the heading size

Text blocks 10 to 12 point

- **CONSIDER TYPE STYLES AND COLORS :**

Three common type styles are bold, italic and underline. These styles are often used for emphasis in print materials. In multimedia applications, however, they are more often used to indicate hypertext or hotwords. Click on hypertext will display additional text, or cause some action, or jump to another part of the application.

- **USE RESTRAINT AND BE CONSISTENT :**

Although it may be tempting and certainly easy to use various typefaces, size, and styles, it is important to exercise restraint. Be careful to avoid the “ransom note”

effect; a busy and difficult to read design resulting from too many fonts and type styles on one screen. In addition, you should try to maintain consistency in the use of text. For example, if several screens have a similar heading, you should use the same typeface, size and style for all such headings.

ACCOMMODATING TEXT-INTENSIVE TITLES

There are times when a title must include a great deal of text. Reference titles such as encyclopedias are good examples. There are two ways to accommodate large amounts of text without overwhelming and perhaps turning off – the user. First, when possible, use other ways to communicate the message. For example, show an animation or use narration rather than write about the idea. Second, consider using a small amount of text and then allowing the user to obtain more information as desired, using one of the following techniques.

- **HYPER LINKING :**

Allow the user to select a hotword or a graphic or button to jump to another part of the title that displays more text.

- **POPUP MESSAGES, SCROLL BARS AND DROP DOWN BOXES :**

Popup message that is displayed when the user clicks on a hotword. A scroll box that displays more information as the user clicks on the down arrow or drags the button on the scroll bar. A drop-down box that can display information when the user clicks on the down arrow. A drop-down box is often used to display a menu of choices from which the user can select.

SOFTWARE FOR CREATING AND EDITING TEXT

Word processing programs, such as Microsoft Word and Word Perfect, are useful in creating text for titles that are text intensive. Once text is created in a word processing system, it can easily be copied to a multimedia title. If the title is not text intensive, it may be more efficient to use graphics programs (Software used to draw and paint images, such as Corel DRAW and Adobe Illustrator) and authoring programs (software used to create multimedia titles) to generate the text.

These programs have text tools that allow you to enter and edit text and select fonts, point sizes and type styles and colors. They also allow you to create special effects, such as distorting or animating the text. Font packages can be purchased that provide a variety of specialized fonts, and programs are available that allow you to create your own fonts. Other sources of text include text that is already in electronic form and text that can be scanned. If a particular printed document was not available in electronic form, or you needed only small parts of it, you could use a scanner and an optical character recognition (OCR) program to

capture desired text. As the document is scanned, the OCR program translates the text into a format that can be used by a word processing program.

WORKING WITH GRAPHICS

Graphics such as drawings and photographs are integral to multimedia titles. Visualization is an important part of the communications process, and graphical images can be used to add emphasis, direct attention, illustrate concepts, and provide a background for the content.

There are two categories of graphics: draw-type and bitmaps.

- (1) **Draw-type graphics**, also called vector graphics, represent an image as a geometric shape made up of straight lines, ovals and arcs. When a line is drawn, a set of instructions is written to describe its size, position and shape. If more than one line is drawn, it has a precise relationship to the other parts, for example a pie chart made up of a circle and lines. The instructions that create the circle and lines establish the relationship between them. If a change is made, say, in the size of the circle, the relationship between the circle and the lines stays the same. If the graphic reduced in size and rotated. The reduced graphic keeps the same relationship as the original graphic. The ability to resize and rotate a graphic without distortion is a major advantage of draw-type graphics. Another advantage is their smaller file size. One of the drawbacks of draw-type graphics is that the more complex they are, the larger the file size and the longer they take to appear on the screen. Another disadvantage is that they cannot display photorealistic quality.
- (2) A **bitmap** represents the image as an array of dots, called pixels. The screen is made up of grid, and each part of the grid is a picture element (pixel), color information, called color depth, is recorded for each pixel. Depending on the number of colors used, a bitmap file can be relatively small.

GRAPHIC IMAGE QUALITY

The quality of the image can be measured in terms of image size, color depth and file size.

IMAGE SIZE, COLOR DEPTH AND FILE SIZE

Screen resolution is measured in horizontal and vertical pixels, with 640 X 480 being standard. The more pixels per inch on the screen, the finer the detail and hence the better the image quality. A screen resolution of 1024 X 768 displays a much better quality image than 640 X 480 on the same size monitor. Various numbers of colors can associated with each pixel, depending on the number of bits specified (8 bit, 256 colors; 16 bit, 65,536 colors; 24

bit 16.7 million colors). The range of colors available for pixels is called the color depth. The file size of a bitmap graphic is related to its image size and color depth. It can be estimated using the following formula.

Image size in pixels X color depth in bits ÷ 8

You divide by 8 because file size is measured in bytes and there are 8 bits per byte.

For Example,

Image Size in pixels	Screen Size	Color Depth in Bits	Number of Available Colors	File Size in Bytes (Approximate)
640 X 480	Full Screen	8	256	3,00,000
320 X 240	Quarter Screen	8	256	77,000
1024 X 768	Full Screen	24	16.7 million	24,00,000

SOFTWARE FOR CREATUBG AND EDITING GRAPHICS

Graphics programs are the tools that allow an artist to create and edit designs used in multimedia titles. There are dozens of graphics programs; some come with operating systems, such as Microsoft Paint which come with Windows 95, and others are included in authoring programs used to create multimedia titles. These are relatively unsophisticated programs, however, lacking many features found in high-end applications. Generally, graphics programs can be categorized as drawing, paint and image-editing programs.

Drawing Programs – those creating draw-type graphics-provide for freehand as well as geometric shapes and are useful in creating designs where precise dimensions and relationships are important. For example, Adobe Illustrator.

Paint Programs – Those creating bitmaps are useful in creating original art, because they provide the tools (brushes, pens, spray paint) used by artists. For example, Paint Shop Pro.

Image-editing programs – are useful for making changes to existing images, such as manipulating the brightness or contrast, or applying textures or patterns. For example, Photoshop.

FEATURES OF GRAPHICS PROGRAMS

Following is a list of features that are available on high-end graphics programs.

- **Type of graphic program** : The program is primarily a drawing, a paint(bitmap), or an image-editing program. Many programs allow you to create both draw and paint type graphics.

- **Cross-platform compatibility** : The program comes in both a Windows and a Macintosh version, and/or is able to create graphics that can be used on both the Macintosh and Windows Platforms.
- **Graphics file support** : The program allows saving and/or converting graphic images using several of the more popular file formats, such as TIFF (Tagged Image File Format), BMP (bitmaps), PCX (Windows Paint), PICT (Macintosh picture format), and so forth. With the enormous interest in the world wide web, JPEG (Joint Photographic Expert Group) files are becoming more important, because they are the standard file formats for the world wide web.
- **Layers** : The program supports object layering, which allows you to include more than one bitmaps in an image and edit each bitmap independently of the others.
- **Image enhancement with painting tool** : The program has pencil, brush, airbrush, text, and line tools; user-defined brushes and the ability to preview the brush size and an option to paint with textures and patterns and to retouch using smudge, sharpen and blur features.
- **Selection tools** : The program allows selection of any part of an image using a freehand tool, including selection of all the pixels of a certain color. It also allows the use of masks to isolate parts of an image and apply a special effect such as a drop shadow.
- **Color Adjustments** : The program allows you to adjust image color and choose from a range of colors simultaneously. You can selectively change hue (the shade or color itself), saturation (the relative brilliance or vibrancy of a color), and brightness.
- **Image manipulation** : The program can stretch, skew and rotate an image.
- **Filters** : The programs has filters for sharpening, softening, and stylizing the image.
- **Antialiasing** : The program supports Antialiasing. Because bitmaps made up of rectangular pixels, the outside edge of the image can appear jagged. Antialiasing smoothes the edges by blending the colors on the edge of the image with the adjacent colors.
- **Text support** : The program allows manipulation of PostScript and TrueType fonts (standard font types for the Macintosh and Windows operating Systems).
- **Graphics tablets** : The program supports pressure-sensitive graphics tablets.
- **Open architecture** : The program is compatible with third-party software such as programs that provide special effects.

SOURCES OF GRAPHIC IMAGES

Draw and paint-type programs are used to develop graphic images from scratch. Following are other ways to generate graphics that can be incorporated into a multimedia title.

- **Clip art, Stock photographs, and fine art :** Some graphics programs come with clip art and stock photographs, but these are often limited or of poor quality. Several companies specialize in providing images for multimedia titles. For example, Photodisc, a leader in digital stock image, provides more than 50,000 photographs that can be purchased on CD or accessed from its website. Corel Gallery 2 has 15,000 clip-art images, and Corel Stock Photo Library has 20,000 photographs. These large CD libraries have a function that allows you to search for an image using descriptive words. For example, if you wanted to view photos of sunsets, you might search using the word sun or sunset, and a list of photos would appear. The companies that sell clip art and stock photographs often allow you to use the graphics in a multimedia title and to distribute the title without paying a royalty. The Corbis Corporation provides images from a wide variety of sources, including leading professional photographers, museums, cultural institutions, public and private archives, and private collections. Corbis has more than 17 million images, including the Ansel Adams collection.
- **Video Images :** Pictures from video sources such as VCRs, videodiscs, and video cameras can be transferred to a computer, and individual frames can become graphic images.
- **Still Images :** Digital cameras specifically designed to capture images in a digital form are useful in generating graphics. You take a picture as you would with any still camera. Then the camera is connected to a computer, and the images are transferred from the camera to the computer. The programs that come with the camera allow you to name, sort, resize, rotate and save the images. Photographs that are taken with a regular camera can be made into graphic images by scanning directly into a computer or writing to a Photo CD. Photo CDs can hold approximately 100 images, and many film-processing outlets can create a Photo CD from an ordinary roll of film.
- **Scanned images :** One of the most useful pieces of equipment for generating graphics is a scanner. Depending on the type of scanner and the sophistication of the program, you can zoom in and crop specific parts of an image before capturing it. You can edit the image by adjusting colors, contrast and brightness. All sorts of images can be scanned, including photographs, illustrations from books, drawings, slides – even objects, although they will display in two-dimensional form. Using a scanner to capture images from objects such as leaves, bricks, fabric or aluminum foil provides a

way to generate creative graphics that can be used for backgrounds in a multimedia title.

- **Screen Capture Program** : Both Macintosh and Windows-based computers allow you to capture as a graphic whatever is on the computer screen. When you hold down the Command and Shift keys and press 3 on the Macintosh, whatever is on the screen is captured as a graphic file. When you press the Print Screen key on a Windows-based computer, whatever is on the screen is placed on the Clipboard and can be pasted into a graphics program and then saved as a graphic file. In addition, there are programs such as Hijack Pro and Collage Plus that are specifically designed to capture a screen or part of a screen and save it as graphic file of a type you specify. Capturing a screen can be useful if you are working with text that you want to display as a graphic. You could type the text using a word processing program and then capture it on-screen as a graphic.

SOUND

In the early days of using desktop computers, usually the only sound that you heard was a beep often accompanied by an error message. Now a whole range of sounds can be played through a computer, including music, narration, sound effects, and original recordings of such events as a presidential address or a rock concert. Sounds are critical to multimedia. Often sound provides the only effective way to convey an idea, elicit an emotion, or dramatize a point. How would you describe in words or show in an animation the sound a whale makes? Think about how chilling it is to hear the footsteps on the stairway of the haunted house. Consider how useful it is to hear the pronunciation of "Buenos dies" as you are studying Spanish.

To study the use of sound in computers, you need a basic understanding of sound. When we speak, vibrations, called sound waves, are created. These sound waves have a recurring pattern that is called an **analog wave pattern**. The wave pattern has two attributes that affect how you work with sound on a computer: *volume* and *frequency*. The height of each peak in the sound wave relates to its volume the higher the peak, the louder the sound. The distance between the peaks is the frequency the greater the distance, the lower the pitch. Frequency is measured in hertz (Hz). A pattern that recurs every second is equal to 1 Hz. If the pattern recurs 1,000 times in 1 second, it would be 1,000, or 1 kHz (kilohertz).

SAMPLING

In order for a computer to Work with sound waves, they must be converted from analog to digital form. This is done through a process called sampling, in which every fraction of a second a sample of the sound is recorded in digital bits. There are two factors that affect the quality of the digitized sound: the number of times the sample is taken, called the sample rate; and the amount of information stored about the sample, called the sample size.

The three most common sample rates are 11.025 kHz, 22.05 kHz, and 44.1 kHz. The higher the sample rate, the more samples that are taken and, thus, the better the quality of the digitized sound. The two most common sample sizes are 8 bit and 16 bit. An 8-bit sample allows 256 values that are used to describe the sound, whereas a 16-bit sample provides 65,536 values. Again, the greater the sample size, the better the quality of the sound.

Sample Rate	Bit Value	Size of File
44.1 kHz	16	1.75 MB
44.1 kHz	8	882 KB
22.05 kHz	16	882 KB
22.05 kHz	8	440 KB
11.025 kHz	8	220 KB

The above table shows the file size (in bytes) for 10 seconds of digital audio given various sample rates and bit values. The following formula is used to determine the byte size of a 1-second recording:

sample rate X bit value 8

Thus a 1-second recording at a sample rate of 44.1 kHz and 16 bits would be 88,200 bytes (44,100 x 16 8). You would double this number for a stereo recording. The 44.1 kHz 16-bit sample is CD quality; whereas the 11.025 kHz 8-bit sample would be marginal quality.

A sound card, is used to digitize sound. A sound from some external source is sent to the card. The external source could be a cassette tape, videotape player, CD, or someone speaking into a microphone. The sound card samples the sound based on the sample rate and bit value and produces the digital approximation of the analog signal.

Once a sound has been digitized, it can easily be manipulated using a sound- editing program. Figure 4.5 shows a sound-editing program and some of its features. Using the mouse pointer, you can select part of the recording and • cut it out of the pattern or replace it with another sound. Or you can choose to add sound effects such as an echo or fade-in and fade-out.

MIDI

Another way to incorporate sound into multimedia titles is with MIDI files. MIDI, which stands for Musical Instrument Digital interface, is a standard format that enables computers and electronic musical instruments to communicate sound information. Digitized audio begins with a sound, samples it, and creates a digital representation which is stored in a file. MIDI begins with an event, such as pressing a key on an electronic musical instrument such as a MIDI keyboard, and codes the event (including which key and how hard and long it was pressed) as a series of commands. These are stored in a file and can be sent from the computer to another instrument, such as a synthesizer, for playback.

MIDI has been compared to a musical score, because it represents the notes that are played, along with such information as volume and frequency, rather than the sound itself. This level of detail allows more-precise editing than with digitized sound. Also, because MIDI files contain code instead of the actual digitized sounds, they can be hundreds of times smaller than audio files. On the other hand, working with MIDI requires specialized software and may require additional equipment for recording and playback, or a MIDI-compatible audio card.

ANIMATION

We often think of animation as full-length Disney movies and Saturday-morning cartoons in which illustrated heroes and villains and especially animal characters come to life. Television programs, movies, and videos are part of our daily lives. Animation plays a huge role in entertainment (providing action and realism) and education (providing visualization and demonstration). Entertainment multimedia titles in general, and children's titles specifically, rely heavily on animation. But animation can also be extremely effective in other titles, such as training applications. For example, say a mechanic needs to be trained on a hydraulic system for the landing gear of a jet plane. The training includes information on the flow of hydraulic fluid through the system. It might be impossible to videotape the actual flow of the fluid inside the landing gear, but an animation could provide a simulation and even dramatize how pressure is created during the process.

The perception of motion in an animation is an illusion. The movement that we see is, like a movie, made up of many still images, each in its own frame. Movies on video run at about 30 frames per second (fps), but computer animations can be effective at 12 to 15 fps. Anything less results in a jerky motion, as the eye detects the changes from one frame to the next.

2D ANIMATION

There are two types of 2-D animation, cel and path. Cel animation is based on the changes that occur from one frame to another to give the illusion of movement. Cel comes from the word celluloid (a transparent sheet material) which was first used to draw the images and place them on a stationary background. Notice that the background remains fixed as the object changes from frame to frame. You could have more than one object move against a fixed background.

Computer-based **cel animation** is usually done with animation programs, although some multimedia authoring programs can create cel animations.

Path animation moves an object along a predetermined path on the screen. The path could be a straight line or it could include any number of curves. Often the object does not change, although it might be resized or reshaped. This can be a relatively easy process, because you need only one object (the ball), rather than several objects. Path animations can often be created using a multimedia authoring program by simply dragging the mouse pointer around the screen, or by pointing to different locations on the screen and clicking the mouse button. Some authoring programs even allow you to set the object's beginning position on one frame and its ending position on another frame; then the program uses a technique called **Tweening** to automatically fill in the intervening frames.

3D ANIMATION

Although 2-D animation can be effective in enhancing a multimedia title, 3-D animation takes the entire experience of multimedia to another level. Three-dimensional animation is the foundation upon which many multimedia CD games and adventure titles are constructed. Top-selling products such as *Myst* and *7th Guest* use 3-D animation to bring the user into the setting and make him or her seem a part of the action. Whether opening doors, climbing stairs, or exploring mysterious rooms, the user is a participant, not a spectator. Creating 3-D animation is considerably more complex than 2-D animation and involves three steps: modeling, animation, and rendering.

Modeling is the process of creating 3-D objects and scenes. One technique involves drawing various views of an object (top, side, cross-section) by setting points on a grid. These views are used to define the object's shape. The animation step involves defining the object's motion and how the lighting and views change during the animation. Rendering is the final step in creating 3-D animation and involves giving objects attributes such as colors, surface textures, and degrees of transparency. Rendering can take considerable time (days), depending on the complexity of the animation. There are different rendering processes, varying in time needed and quality of the completed animation. Animators therefore often render the animation using a quicker, lower-resolution process as a test. Then they use a

slower, higher-quality process for the finished animation. Strata Pro 3D, Swivel 3D, and 3D Studio are examples of programs.

ANIMATION SPECIAL EFFECTS

A common special effect for animations is morphing. **Morphing** is the process of transforming one image into another via a series of frames. An example would be a photo kiosk in which two people would have their pictures taken and a photo would be generated by the computer that combines their images. The morphing process involves selecting sets of corresponding points on each of the images. Thus, in morphing the two faces, the sets of points might include eyes, lips, ears, and outline of the head. Based on these sets of points, the morphing program rearranges the pixels to transition the original image into the second via a series of intervening images. Morphing is useful not only in showing how two images blend together, but also in showing how an image might change over time. Warping is a related special effect that allows you to manipulate a single image. For example, you could stretch a facial feature to change a frown into a smile.

VIRTUAL REALITY

Virtual reality (VR) attempts to create an environment that surrounds the user so that he or she becomes part of the experience. The term virtual reality has been used to describe various types of applications some that are more experiential than others, as the following examples illustrate.

- Boeing uses flight simulators that are cockpits of actual airplanes, mounted on hydraulically controlled legs that can simulate every motion of an aircraft. Flight crews training in these simulators can be presented with any number of environments (airports, weather conditions, landing approaches) on displays viewed through the cockpit windows. These simulators are so realistic that the Federal Aviation Administration (FAA) will approve current pilots for certification on a specific model using the simulator alone.
- In some compact disc based adventure games, the surroundings change as the user points the mouse cursor and walks through doors, up stairs, turns left or right, or otherwise moves through the various scenes. The goal of the multimedia developer is to make it seem as though the user is actually standing in the middle of a room, or in an arcade, or in a haunted house, and so on. Related applications are those that allow a walk-through of a building. A popular title is a walk-through of the White House, which allows the user to view different rooms and to zoom in on objects such as paintings and sculptures.
- There are arcade-type games and educational applications that require headgear with goggles that allow the user to "step into" a virtual world. As the user turns his head, a different view of the world appears. Gloves and handheld equipment can be used to allow the user to interact with the environment.

Although most virtual reality applications are animations, Apple Computer has developed a QuickTime VR system. This system starts with photographs taken in a panoramic format. This is accomplished by mounting a digital camera on a tripod that allows the user to take a series of still pictures. The camera is rotated a few degrees after each picture, until a complete 360-degree panorama is obtained. These photographs are electronically "stitched" together to provide a seamless 360-degree view. The files created with this system can be brought into a multimedia title that allows the user to point the mouse cursor to navigate around the setting and to zoom in on any, object.

Because virtual reality is so 3-D graphic intensive, it is not as applicable to home and school CD titles that are played on typical multimedia computers.

VIDEO

The ability to incorporate digitized video into a multimedia title marked an important achievement in the evolution of the multimedia industry Consider the following: You are developing a report on the civil rights movement in the United States to be presented to your fellow students. The purpose is to inform them of various significant events. You want to include excerpts from Martin Luther King Jr.'s "I Have a Dream" speech. You could:

- Type part of the speech and hand it out (text)
- Show a photo of Martin Luther King Jr. (graphics)
- Play an audio except of the speech (sound)
- Play a video except of the speech (video)

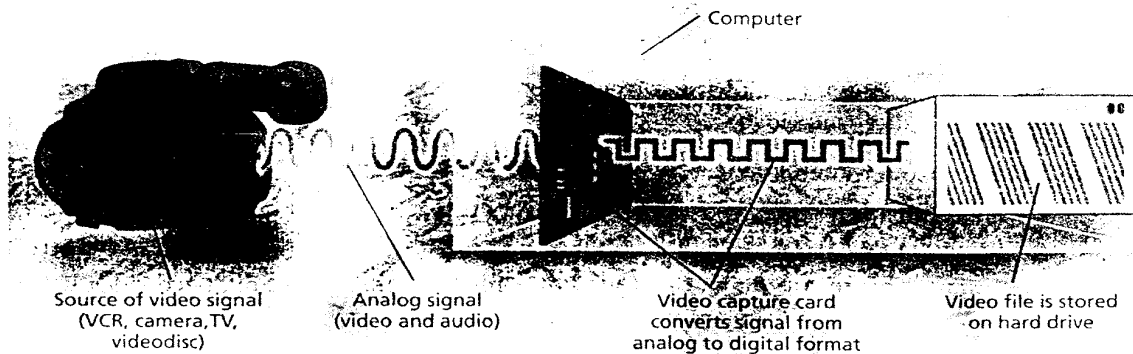
Those viewing the video would recognize the impact of seeing the actual event rather than simply reading about it or listening to it. Video brings a sense of realism to multimedia titles and is useful in engaging the user and evoking emotion.

DIGITIZING THE VIDEO SIGNAL

Video, like sound, is usually recorded and played as an analog signal. It must therefore be digitized in order to be incorporated into a multimedia title. Figure 4.12 shows the process for digitizing an analog video signal. A video source, such as a video camera, VCR, TV, or videodisc, is connected to a video capture card in a computer. As the video source is played, the analog signal is sent to the video card and converted into a digital file that is stored on the hard drive. At the same time, the sound from the video source is also digitized.

Figure 4.12

The process for digitizing an analog video signal



One of the advantages of digitized video is that it can be easily edited. Analog video, such as a videotape, is linear; there is a beginning, middle, and end. If you want to edit it, you need to continually rewind, pause, and fast-forward the tape to display the desired frames. Digitized video, on the other hand, allows random access to any part of the video, and editing can be as easy as the cut-and-paste process in a word processing program. In addition, adding special effects such as fly-in titles and transitions is relatively simple.

FILE SIZE CONSIDERATIONS

Although digitized video has many advantages, there is an important consideration: file size. Digitized video files can be extremely large. A single second of high-quality color video that takes up only one-quarter of a computer screen can be as large as 1 MB. Several elements determine the file size; in addition to the length of the video, these include frame rate, image size, and color depth.

Frame rate : Earlier you learned that animation is an illusion caused by the rapid display of still images (frames). Television and movies play at 30 fps, but acceptable playback can be achieved with 15 fps.

Image size : A standard full-screen resolution is 640 x 480 pixels, but often video is more appropriately displayed in a window that is one-fourth (320 x 240) the size of the full screen.

Color Depth :

Color depth Digitized video is really made up of a series of still graphic bitmaps. Hence the quality of video is dependent on the color quality (related to the number of colors) for each bitmap. As you learned earlier, an 8-bit color depth provides 256 colors, 16-bit provides more than 64,000 colors, and 24-bit provides over 16 million colors.

Using the following formula, you can estimate the file size of 1 second of digitized video:

$$\text{fps} \times \text{image size} \times \text{color depth} \div 8 = \text{file size}$$

Thus 1 second of video at a frame rate of 15 fps, with an image size of 320 x 240 and a color depth of 24 bits, would equal a file size of 3.5 MB. This means that a CD could hold only three minutes of digitized video with the stated frame rate, image size, and color depth.

Although it might be desirable to run several minutes of photorealistic full-screen video at 30 fps, it may not be feasible. The file size would be prohibitive, and the current playback multimedia systems would not support the processing power required. Thus the use of video becomes a trade-off between quality and file size. What constitutes acceptable quality depends on the purpose of the title and the intended audience. Reducing the color depth below 256 colors yields a markedly poorer-quality image. Also, reducing the frame rate to below 15 fps causes a noticeable and distracting jerkiness that is usually unacceptable. Changing the image size and compressing the file therefore become primary ways of reducing file size.

You usually do not need to show full-screen video in a multimedia title, because it is only one of several elements that appear on-screen. Other elements might include text and navigational buttons. The video can therefore be played in a window as small as one-quarter or even one-sixteenth of the screen. One technique is to use video for the parts of an object that are changing. For example, assume you want to show a dinner table with a lit candle. The flame of the candle is the only moving part of the screen. Instead of creating a video of the entire table with the candle, you could use the table as a background still image and videotape only the flame. Then you could play the flame in a window at the tip of the candle, giving the impression that the entire screen is one video. The video could be played continuously to create the motion of a flickering candle. In most cases, a quarter-screen image size (320 x 240), an 8-bit color depth (256 colors), and a frame rate of 15 fps is acceptable for a multimedia title. And even this minimum result in a very large file size

VIDEO COMPRESSION

Because of the large sizes associated with video files, video compression/decompression programs, known as codecs, have been developed. These programs can substantially reduce the size of video files, which means that more video can fit on a single CD and that the speed of transferring video from a CD to the computer can be increased. There are two types of compression: lossless and lossy. Lossless compression preserves the exact image throughout the compression and decompression process. An example of when this is important is in the use of text images. Text needs to appear exactly the same before and after file compression. One technique for text compression is to

identify repeating words and assign them a code. For example, if the word multimedia appears several times in a text file, it would be assigned a code that takes up less space than the actual word. During decompression, the code would be changed back to the word multimedia. Lossy compression actually eliminates some of the data in the image and therefore provides greater compression ratios than lossless compression. The greater the compression ratio, however, the poorer the decompressed image. Thus, the trade-off is file size versus image quality. Lossy compression is applied to video because some drop in the quality is not noticeable in moving images.

Certain standards have been established for compression programs, including *JPEG* (Joint Photographic Experts Groups) and *MPEG* (Motion Picture Experts Group). Both of these programs reduce the file size of graphic images by eliminating redundant information. Often areas of an image (especially backgrounds) contain similar information. JPEG compression identifies these areas and stores them as blocks of pixels instead of pixel by pixel, thus reducing the amount of information needed to store the image. Compression ratios of 20:1 can be achieved without substantially affecting image quality. A 20:1 compression ratio would reduce a 1 MB file to only 50 KB.

MPEG adds another process to the still-image compression when working with video. MPEG looks for the changes in the image from frame to frame. Key frames are identified every few frames, and the changes that occur from key frame to key frame are recorded.

MPEG can provide greater compression ratios than JPEG, but it requires hardware (a card inserted in the computer) that is not needed for JPEG compression. This limits the use of MPEG compression for multimedia titles, because MPEG cards are not standard on the typical multimedia playback system.

Two widely used video compression software programs are Apple's QuickTime (and QuickTime for Windows) and Microsoft's Video for Windows. QuickTime is popular because it runs on both Apple and Windows-based computers. It uses lossy compression coding and can achieve ratios of 5:1 to 25:1. Video for Windows uses a format called Audio Video Interleave (AVI) which, like QuickTime, synchronizes the sound and motion of a video file.

SOFTWARE FOR CAPTURING AND EDITING VIDEO

Several steps are needed to prepare video to be incorporated into a multimedia title. These include capturing and digitizing the video from some video source, such as a video camera, VCR, TV, or videodisc; editing the digitized video; and compressing the video. Some software programs specialize in one or the other of these steps, and other programs, such as **Adobe Premiere**, can perform all of them. Although capturing and

compressing are necessary, it is editing that receives the most attention. Editing digitized video is similar to editing analog video, except that it is easier. For one thing, it is much quicker to access frames in digital form than in analog. For example, with analog video, a lot of time is spent fast-forwarding and rewinding the videotape to locate the desired frames; whereas with digital editing you can quickly jump from the first frame to the last—or anywhere in between. Removing frames or moving them to another location is as easy as the cut-and-paste process in a word processing program. The following are some other features that may be included in editing software programs:

- ❖ Incorporating transitions such as dissolves, wipes, and spins
- ❖ Superimposing titles and animating them, such as a fly-in logo
- ❖ Applying special effects to various images, such as twisting, zooming, rotating, and distorting
- ❖ Synchronizing sound with the video-
- ❖ Applying filters that control color balance, brightness and contrast, blurring, distortions, and morphing.

AUTHORING PROGRAMS

Authoring Programs are used to create multimedia titles. They help the developer do all of the following tasks:

- Produce content with paint, text and animation tools
- Design screen layout using templates
- Create interactivity
- Incorporate text, sound, video, animation and graphics
- Create hyperlinks

Multimedia authoring programs vary significantly in the features they provide and in their cost and ease-of-use. There are dozens of authoring programs to choose from, and various ways to compare them. These include the following criteria:

- Platform (Mac and/or PC) used for development and playback
- Way the developer works with them and ease of use
- Feature (paint tool, animation tool, programming language)
- Price
- Learning curve
- Ability to develop multimedia applications that can be delivered via the internet.

Two ways in which multimedia is used are in presentations and as standalone titles. It is helpful to distinguish between these uses, because the type of application affects the design of the title, the cost, development time and often the authoring program used.

MULTIMEDIA PRESENTATIONS :

Multimedia presentations involve a presenter and an audience of one or more persons. Examples include the following:

- A college professor lecturing on the art collection of the Hermitage Museum in St.Petersburg and using a computer to display various paintings as well as biographic of the artists.
- A sales presentation in which a representative uses a computer to display the company's new product line, including animations of how the products work.
- A corporate CEO making a presentation at the annual stockholders' meeting and using a computer to display highlights of the past year, pictures of corporate officers, and financial data.

In these cases, the presenter has control over the multimedia title, and it is primarily a one-way, linear communication process. If the multimedia title allows the presenter to quickly navigate through the contents of the title, a great deal of interactivity can be built into the presentation. For example, a sales representative may be making a pitch to a prospective client that starts with a relatively linear presentation about her company's history and product line. Then she may ask a few questions and, based on the responses, jump to information about pricing or product availability or to video clips of testimonials from current customers. These types of presentations are useful when the presenter wants to utilize the power of multimedia while maintaining control of the presentation. Many of these presentations are similar to a slide show and can be developed easily, quickly, and inexpensively.

STAND-ALONE APPLICATIONS :

Stand alone titles are those that are intended for use by individuals in a one-on-one situation. Examples include the following:

- A computer based simulation of biology lab procedure in which students learn how to dissect a frog.
- An informational kiosk located in a shopping mall, with which customers can locate various stores and product lines.
- An interactive CD-based encyclopedia located in a library.
- A CD based sales catalog distributed through the mail to potential customers.
- A corporate training CD used to teach employees how to deal with angry customers.
- A solve-the mystery adventure game distributed on CD.

The primary differences between presentation and stand-alone titles are who has control and the amount of interactivity that is involved. A major advantage of stand-alone title is that the user has control and can determine what to view and review based on his or

her needs. It is possible, however, for developers to build into these titles conditions that the user must satisfy before proceeding along a certain path. For example, in an adventure game the user might be required to solve a puzzle before being allowed through a certain door, or in an educational title the user might be required to take a pretest that determines which tutorial can be accessed.

All stand-alone authoring programs have one thing in common; the ability to create hyperlinks. Hyperlinking is the process of establishing a relationship (link) between two elements or objects within a title. An example would be a word or phrase, called a hotword or hypertext, that, when clicked, causes the program to jump to another screen. Because control is turned over to the user, several design, navigation, and “what-if” issues must be addressed. This makes these titles generally more difficult, expensive, and time consuming to develop than presentation-type titles.

HOW AUTHORIZING SYSTEM WORK

Multimedia authoring systems can be categorized by the way in which they work i.e., metaphor used. These include the electronic slide show, the card stack or book, icon-based programs and time based programs using a movie metaphor.

1. ELECTRONIC SLIDE SHOWS :

Giving an electronic slide show presentation is similar to using overhead transparencies or traditional photographic slides. Programs such as Microsoft PowerPoint, Adobe Persuasion, Asymetrix Compel used a slide show metaphor.

These types of programs have several advantages. They are relatively inexpensive, easy to learn, and easy to use. These programs provide templates with different background colors and graphics and allow you to incorporate all of the multimedia elements, including video, animation and sound. Some program has Hyperlinking capabilities that allow the user to navigate to any part of the application.

2. THE CARD STACK AND BOOK METAPHORS :

One of the first multimedia authoring programs was HyperCard. HyperCard uses a card stack metaphor. Cards are developed that have different elements associated with them and are put to stacks. You can link the cards by allowing the user to click on buttons or other elements and jump to a different card in the stack.

A similar type of program uses a book metaphor, in which each page represents a different screen, and the pages combine to make up a book. ToolBook by Asymetrix is an example of this type of program. These are two levels in this program : author and reader. The author level allows you to create the title, whereas the reader level allows you to interact with it as a user.

The advantages of using the card and book type authoring programs include the ease in understanding the metaphor, and the straightforward relationship between what is displayed on any particular screen and what is created on a card or page. These programs also provide templates that reduce development time.

3. ICON BASED AUTHORIZING PROGRAMS :

With icon based programs, you use symbols in a flowchart scheme. Each icon represents a particular event. For example, the wait icon stops the process until the user clicks the mouse button or presses a key, or a specific amount of time passes.

An advantage of icon based programs is that you can easily see how a title is structured that is, the flow of a program and especially the branching. This makes it easy to edit and update the program by merely adding or deleting icons representing content or events.

4. TIME BASED AUTHORIZING PROGRAMS :

Time based programs use a movie metaphor. That is, like a movie on videotape, you start the multimedia title and it plays until some action causes it to pause or stop. Director movies are made of a series of individual frames. Each frame consists of up to 48 objects such as graphics buttons, and text placed on a stage. As the movie is played, frames are displayed, revealing their elements. They are good for creating animations.

5. WEB BASED AUTHORIZING PROGRAMS :

As the World Wide Web has become more viable as a distribution alternative for multimedia, companies are adapting their authoring tools to accommodate the web. Asymetrix and Quest provide versions of their authoring programs specifically designed for developing multimedia title to be delivered over the Internet. Macromedia provides a utility program called Shockwave, that allows an Internet user to play Director Movies; and Microsoft provides its ActiveX controls that allow movies, animations and sound to be delivered over the Internet.

DELIVERING MULTIMEDIA

The following are different methods of delivering multimedia.

1. COMPACT DISC

The growth of multimedia is often expressed in terms of the growth of Compact Disc(CD) titles. CDs are popular medium because they can hold substantial amounts of data, including sound and video. They are relatively inexpensive, easy to mass produce, distribute and transport and they take up little retail shelf space.

2. KIOSK

A kiosk is a stand alone or networked computer system that allows the user to access information performs transactions, and even plays games. Examples are college information kiosks that students use to learn about academic programs, print out schedules and transcripts, and access a campus map, retail store kiosk that allow customers to locate merchandise, print out coupons, and purchase products and museum kiosks that allow the user to locate specific works of art, view parts of a collection that are not on display, and obtain detailed information about the artists.

3. ONLINE

One of the fastest growing areas for multimedia delivery is online, which includes telecommunications and the Internet. Telecommunications involving phone lines, satellite, and cable transmission is being used by educational institutions to deliver multimedia courseware to rural areas, and by companies for teleconferencing and training. The use of the Internet is growing exponentially, companies are developing home pages for the World Wide Web that allow customers to purchase products, access product, information including video demonstrations, and even subscribe to real time multimedia events such as rock concerts.

UNIT III – DEVELOPING MULTIMEDIA

STEPS IN DEVELOPING INTERACTIVE MULTIMEDIA

The three phases of multimedia development and the steps they involve are given below:

Phase 1 – Planning

- Step 1 : Developing the concept
- Step 2 : Stating the purpose
- Step 3 : Identifying the target audience
- Step 4 : Determining the treatment
- Step 5 : Developing the specifications
- Step 6 : Storyboard and navigation

Phase 2 – Creating

- Step 7 : Developing the content
- Step 8 : Authoring the title

Phase 3 – Testing

- Step 9 : Testing the title

THE PLANNING PHASE

STEP 1 : DEVELOPING THE CONCEPT

Every multimedia project originates as an idea. The idea for what was to become a series of very popular multimedia title. The process of generating idea can be as unstructured as brainstorming session. The company might have a process for generating new product ideas that includes asking questions about the current product line. Such a series of questions might consist of the following :

- How can we improve it (make it faster, use better-quality graphics or updated content)?
- How can we change the content to appeal to a different market (consumer, education, corporate)?
- How can we take advantage of new technologies (virtual reality, speech recognition)?
- How can we make it disposal?
- How can we change it from a single title to series?
- How can we repackage or repurpose our content (books, movies, games, reference materials, brochures, magazines)?

Ideas can provide the vision, but they must be presented in a way that can guide the development process. That is, they must be stated as clear, measurable, and obtainable objectives.

STEP 2 : STATING THE PURPOSE

Once a concept has been developed, project goals and objectives need to be specified. This is perhaps the most critical step in multimedia planning. Goals are broad statements of what the project will accomplish, whereas objectives are more precise statements. Goals and objectives help direct the development process and provide a way to evaluate the title both during and after its development. Because multimedia development is a team process, objectives are necessary to be stated in measurable terms, and they need to provide for a timeline. The goal for a specific multimedia title must fit within the overall mission of the company or organization.

Example for GOALS,

“Be the leader in educational CDs”

“Use multimedia to reduce our training costs”

“Produce the best CD title on fly fishing”

Example for OBJECTIVES,

“To develop an entertainment title based on the book Tracks which chronicles own women’s journey across the continent of Australia. The title will include an interactive map and allows viewing photographs and text about any selected map location. Sound clips will provide narrations.”

STEP 3 : IDENTIFYING THE TARGET AUDIENCE

The more information a developer has about potential users, the more likely a title can be created that will satisfy the users’ needs and be successful. Audience can be described in many ways, in terms of demographics (location, age, sex, marital status, education, income and so on) as well as life style and attitudes. Developer must determine what information is needed & how specifically to define the audience. There is a trade-off between the size of an audience and a precise definition of it. Companies want to identify as large an audience as possible in order to maximize potential sales. The large the audience, however, the more diverse its needs and the more difficult it is to “give them what they want”.

STEP 4 : DETERMINING THE TREATMENT

“What is the ‘look and feel’ can include such things as the title’s tone, approach, metaphor and emphasis.

tone :

While the title be humorous, serious, light, formal? Many multimedia titles intended for home use, such as games and recreational titles, include humor, whereas those intended for business use are more serious in their tone. Titles intended for children tend to be whimsical, whereas training titles are generally straightforward and conservative.

APPROACH :

How much direction will be provided to the user? Some titles, especially children's games and interactive books, focus on exploration. The child is provided with scene with little or no instructions. The child click on various objects and some action occurs.

Other titles, especially adult education applications, provide a great deal of direction. Users are provided with menu choices and generally must follow predetermined path in order to complete the title. Other titles simply have a help button that triggers a help screen.

METAPHOR :

Will a metaphor be used to provide interest or to aid in understanding the title? The Explorapedia title uses space travel as the theme for exploring different areas of content such as Nature and People. The TOEIC test program uses a mountain-climbing metaphor. The Odyssey humanities instructional program uses a sailing adventure metaphor in which students choose from various island destinations.

EMPHASIS :

It is important to consider the significance of each element based on the concept, objectives & audience for the title. The budget & time are relative weight placed on text, sound, animation, graphics and video. For example, a company may want to develop a title that introduces its product line, including video clip demonstration on how each product works. But if the budget did not allow for the expense of creating the video segments, emphasis would be on still images with text.

STEP 5 : DEVELOPING THE SPECIFICATIONS

Project Specifications to a Specifications list what will be included on each screen, including the arrangement of each element and the functionality of each object (for example, what happens when you click on the button labeled Next). Specifications should be as detailed as possible. The more detailed and precise the specifications, the greater the chance of creating a title that will meet the objectives of the project on time and within budget.

There are certain elements that should be included in the specifications for all titles. These are listed below :

- Target playback system(s)
- Elements to be included
- Functionality
- User interface

Target Playback Systems :

The decision of what computers to target for playback is usually not difficult and in some cases not even discretionary. For example, an instructor who is developing a multimedia presentation would be confined to the playback system set up in the classroom; a sales representative might be restricted by the model of laptop computer that he carries; or a person developing a title that runs on a kiosk would be restricted to the kiosk hardware.

Companies developing commercial titles intended for the business market are guided by the fact that 80 percent of desktop computers are windows based systems. Companies developing for the education market, on the other hand, are faced with a majority of the computers being Apple systems. Household computers are more evenly divided; so many companies targeting the home market develop for both platforms.

Elements to be included :

The specifications should include, as much as possible, details about the various elements that are to be included in the title. If sound is used, should it be recorded at 44 MHz, 16 bit, stereo? Should the resolution for the graphics be 8 bit, 256 colors? Should video be designed to play back at 15 frames per second? At what size? What are the sizes of the various objects such as photos, buttons, text blocks, and pop-up boxes? What font, point sizes and type styles are to be used? What are the colors for the various objects? The multimedia elements chosen may require other specs. For example, if a narration of voice over is used, a script would be part of the specifications.

Functionality :

Objects such as text, graphics, buttons, and hypertext are often part of multimedia title. The specifications should include how the program reacts to an action by the user, such as a mouse click. For example, clicking on a door might cause the door to open; an “Exit the program?” message to appear(text); or an entire new screen to be displayed. The user needs feedback that the button has been selected, such as the button appearing “pressed”, If no feedback is given, the user might click on the button again. Navigating from one screen to next screen using buttons.

User Interface :

The user interface involves designing the appearance how each object is arranged on the screen – and the interactivity – how the user navigates through the title. The design issues relating to multimedia are extremely important, and the next chapter is devoted to studying them.

STEP 6 : STORYBOARD AND NAVIGATION

“What do the screens look like and how are they linked?”

Multimedia borrows many of its development processes from movies, including the use of storyboards. A storyboard is a representation of what each screen will look like and how the screens are linked. The storyboard serves multiple purposes.

- To provide an overview of the project
- To provide a guide (road map) for the programmer
- To illustrate the links among screens
- To illustrate the functionality of the objects

Navigation schemes can be set up in a variety of ways, including sequential, topical and exploratory.

1. *A sequential navigation scheme* takes the user through a more or less controlled, linear process. Example are games with a story line that has a beginning, a middle, and an end; books that are repurposed as multimedia titles; slide show presentations; and instructional tutorials that require the student to move through the material step by step. This method often have buttons (Next, Forward, Continue, Previous, Back) or graphics (arrows, pointing fingers) as navigational aids.
2. *A topical navigation scheme* allows the user to select from an array of choices or even search for specific information. Examples are multimedia encyclopedias, interactive shopping catalogs, and information kiosks, Topical navigation schemes have several layers. This requires special attention when designing the interface to make sure that users understand where they are and what they can do.
3. *An exploratory navigation scheme* provides little structure or guidance. It relies on user interaction, usually the clicking of objects displayed on the screen. Many games, directed at both children and adults, use some form of exploratory navigation.

THE CREATING PHASE

At this point in the development process, the focus changes from planning to production, including creating the content and authoring the title.

STEP 7 : DEVELOPING THE CONTENT

“Creating the pieces”

The specifications, including any scripts, indicate the content to be incorporated into the multimedia title. There are numerous content issues that need to be address:

- What is the level of quality for the content (photorealistic graphics, stereo sound)?
- How will the content be generated (repurpose existing content, hire content experts to write text, employ graphic artist and other professionals)?

- Who will be responsible for acquiring copyrights and licensing agreements?
- How will the content be archived and documented?

We learned about the elements that make up multimedia titles: text, sound, animation and video. We also learned the sources related to these elements; libraries of clipart, sound, and video, scanned photos and slides; draw and paint programs used to create graphics; video capture cards; MIDI synthesizers for music and word processing programs for text. If the goal is to market the title, quality is extremely important. Graphic artists and photographers would be contracted to create original artwork and pictures; actors would be employed for video production and narration; musicians might be hired to write and produce original music and sound effects; and editors would be used to review any text.

Multimedia title can contain hundreds of images, it is important to provide for cataloging the various graphical elements. Database of images would include the name, type and size of the images. This database would be used to keep track of the elements, determine total file size and provide reference for filenames that might be used in scripting.

STEP 8 : AUTHORIZING THE TITLE

“Bringing it all together”

In determining which authoring system to use, a developer would consider the following points:

- The playback system – some authoring programs work with only one platform.
- The emphasis placed on animation – certain programs have fairly sophisticated 2-D animation tools.
- The expertise of the programmer – programs differ greatly in the approach they use (metaphor) and their scripting language.

Authoring a multimedia title can be as simple as creating slide show using presentation software such as Compel. You should select a background, type the text, scan some graphics and import clip art, video, and sound. You could even create buttons with hyperlinks. The entire process would be inexpensive, relatively quick to complete, and require little specialized expertise. These type of titles might be appropriate for the in-house training, lectures, conference presentations, sales presentations and other non-commercial applications.

In commercial applications, authoring plays significant role to provide functionality. Scripting is needed for such things, such as checking user input from the keyboard, accessing an external device (video disc); determining the configuration of the playback system and creating an installation program that is used to start the title.

THE TESTING PHASE

STEP 9 : TESTING THE TITLE

“Does it work the way it was planned?”

Although it is listed as the final step in the development process, testing should be ongoing. Testing can start at the beginning during the concept stage. Small groups of potential users could be shown a prototype of the proposed title to determine its feasibility. Conducting this “proof of concept” can provide valuable information that helps evolve the initial idea and prevent costly oversights.

Testing the design involves how the user interacts with the title and asks questions such as, Does the user understand the navigation scheme, terminology, icons, and metaphors? Does he or she get stuck, confused, or lost interest? Usability testing is a formal process in which potential users are videotaped as they interact with a title and asked to verbalize what they are thinking.

Testing the function of a multimedia title involves making sure it works according to the specifications and answers questions such as Does clicking on each button or object cause the appropriate action? Can animation, sound, and video clips be controlled by the user? Do graphics, text and other elements appear in the correct location.

The functionality can be tested with two processes : alpha testing and beta testing. **Alpha Testing** is usually conducted in-house and is not restricted to the development team. The idea is to “try to make it crash”, and every conceivable action and navigation path should be explored.

Beta Testing is the final functional test before release. It involves selected potential users that could number in the thousands – Windows 95 had 40,000 beta testers. Because the users are outside the company, they are often required to sign nondisclosure agreements to prevent them from revealing information about the title before it is released. Companies try to make it easy for beta testers to provide **feedback** by giving them an e-mail address to contact and /or disk containing a questionnaire that each tester fills out and returns in a prepaid package. To encourage a high level of participation, companies often provide an incentive such as discounts on the finished products. The goal of beta testing is to get feedback from a variety of potential users and test done on as many different computer configurations as possible.

UNIT IV – DESIGNING FOR MULTIMEDIA

CREATING THE APPEARANCE BASIC DESIGN PRINCIPLES:

The application of design principles is important when determining how a screen will look in a multimedia. Screen layout that is typical of many multimedia titles, especially corporate communication, reference and training titles. The objects (heading, text, graphic, and navigation buttons) on the screen are fairly common to these titles, and the question becomes how to arrange them on the screen are fairly common to these titles, and to maintain consistency in the “look and feel” of each screen even when the objects change. Following are selected design principles and examples of their use in multimedia.

BALANCE:

In general, as human being we seek to maintain balance. We want equilibrium in our lives (balance work and play) and in our society (balance the scales of society). Balance has a positive connotation, and therefore, we may respond differently to visual images that are in balance and those that are out of balance.

Balance in screen design refers, in the distribution of optical weight in the layout. Optical weight is the ability of an element (graphic, text, headline, subhead and so on) to attract the user’s eye. Each element has optical weight as determined by the nature and size. The nature of an element refers to its shape, color, brightness and type.

More Optical Weight

Large

Dark

Color

Irregular Shape

Less Optical Weight

Small

Light

Black, White, Gray

Regular Shape

Balance is determined by the weight of the elements and their position on the screen. That is, if you were to divide the screen into four parts, a balanced layout would have about the same weight in each part.

Balance can be achieved through symmetrical design or asymmetrical design. *Symmetrical* balance is achieved through arranging similar elements, such as two graphics of equal weight. *Asymmetrical* balance is achieved by arranging dissimilar elements.

Symmetrical design is static and suggests order and formality. It suitable for multimedia titles that focus on corporate image for conservative organizations such as banks and insurance companies. On the other hand, asymmetrical design is dynamic and suggests

diversity and informality. It might be appropriate for entertainment titles, where a feeling of movement and discovery are important.

Following are ways to achieve balance in design:

- Use even numbers of elements of equal weight (symmetrical)
- Use two or more elements of smaller weight to balance one large element (asymmetrical)
- Enclose text in a box or use a color background to give it more weight
- Surround a dark graphic with abundant white space

Balance can be affected by assigning attributes to elements:

- **Size:** Large objects are perceived to be more important.
- **Position:** Objects that are placed higher on the screen are thought of as more dominant.
- **Color:** The color of an object can imply significance, such as red connoting heat, anger, or stop.
- **Space:** Too many objects too close together may give the impression of clutter and disorganization, whereas a few objects with abundant white space could convey the opposite.

UNITY

Unity has to do with how the various screen elements relate- how they “fit in”. An element that seems out of place can be disconcerting to the user and distract from achieving the desired effect of a particular screen. Unity reinforces the message or theme on individual screens and provides consistency throughout the title.

In multimedia titles unity applies to the interactive design as users navigate from one screen to another. Unity also applies to the design of each screen and to the design of parts of a screen. For example, you would want to relate headings with text, graphics with caption, and video clips with control.

MOVEMENT:

Movement has to do with how the user works through the elements on the screen. In balance design, this might be what is called optical center – a point somewhat above the physical center of the screen. The tendency is to move from upper left to lower right as we proceed through the contents of a screen.

Movement is especially important in training and educational titles in which the designer wants the user to work through the contents in a more structured way.

The designer will try to effect movement and emphasize various elements by applying certain design techniques:

- Controlling where the user starts on the screen by placing emphasis on a graphic, headline, or text block
- Creating asymmetrical balance
- Using lines or objects that point in a certain direction
- Using color gradients that go from a light shade to a dark shade
- Having people or animals looking in the direction you want the user to look

The designer can emphasize an element by making it a contrasting shape or color, surrounding it with white space, using a different font or type style, creating borders, and using different backgrounds for selected objects.

DESIGNING FOR INTERACTIVITY

The basic design principles presented here are, in varying degrees, useful for any multimedia title, but they focus on only the appearance. The goal of multimedia design is to develop an interface that will allow user control in a way that works with the content while addressing the needs of the users (For example, if a sound is played, the user should be able to adjust the volume). In other words, the design needs to be user centered. Several things affect the nature of the interactive design, including the audience, type of title, and content.

AUDIENCE:

Foremost in guiding the interactive design process is the end user. As much as possible, the designer must understand the user's needs and how they work with the product. The tendency of the designer is to approach the design process from his or her perspective, reflecting personal knowledge and experiences. Designers might be computer "power users", understanding graphical interfaces, metaphors, icons and menu based navigational schemes, whereas the intended user might be a novice who is intimidated by the computer. For example, they might double click the mouse button to open program works. This user action might not have occurred to the multimedia click. The challenge for designers is to put themselves in the place of the user by asking some very fundamental questions:

- What does the user see on the screen?
- What does the user want to do?
- What is the user's realm of experience?

TYPE OF TITLE:

The type of title affects the design as illustrated in the following examples.

- If the title is a corporate annual report and the user wants to quickly access specific information, the design might need to accommodate only a main menu with a straightforward navigation scheme and the user's ability to point and click the mouse.
- If the title is a reference work, such as an encyclopedia, the designs might become more complex as the user is given the ability to access a topic in several ways – menu, index, object, or key word search.
- If the title allows transaction, such as a registration kiosk at a college, the designer must consider how the users know which field is active, how to move from field to field, and how to indicate when they are done with a field and when they are done with the form.
- If the title is a game and the focus is on entertainment, the design might allow random interaction. Because the focus is on exploration and discovery, users are not as concerned with where they are and what they can do next.

CONTENT:

Following are examples of the ways that content can influence the design of a title's interactivity.

Large amounts of content:

One of the major considerations in designing interactivity is how many levels to navigate. The tendency is to add more levels as the content increases. The more levels, however, the greater the chance for confusion and frustration as users try to determine where they are, how they got there, and how they can get back to where they started. There are numerous ways to reduce the levels in a multimedia title:

- Provide shortcuts in the form of hotwords or hot spots that skip several levels
- Replace parts of the original screen with new content, but leave the shell of the screen intact to maintain the user's frame of reference
- Use pop-up windows that display additional information
- Use scroll bars for text intensive titles
- Provide tabs or bookmarks that indicate where the user has been and allow the user to quickly return to previously viewed screen.

Elements used in the title:

Another way content affects interactive design is in the elements used. There are ways to accommodate text-intensive titles. If video (or animation or sound) is used, there are certain decisions to be made that affect interactive design:

- Who controls the video? Does the video play automatically or can the user stop and start.
- If it starts automatically, can the user pause, stop, rewind, and cancel it? The user may have previously viewed the video and does not want to see it again.
- What will the controls look like? Most people are familiar with standard VCR controls, but these controls may not visually complement the rest of the screen.
- Can the sound volume be adjusted?
- Where and when does the video image appear on the screen?

Nature of the content:

The content can suggest a theme that the interactive design would need to complement and reinforce, as illustrated in the following examples:

- In a title on astronomy in which students study the night sky, the view could be through a telescope that the user manipulates with the mouse.
- A reference title on the history of cinema might include a control room with buttons that are used to open curtains and play video clips that appear in a window resembling a movie screen.
- In a title that is a walk-through of a museum, the interactive design might include a virtual reality environment in which the mouse pointer is used to navigate through the museum and the mouse button is used to zoom in on paintings.

GUIDELINES FOR INTERACTIVE DESIGN:

Following are general guidelines that are useful in designing interactive multimedia, especially informational titles.

MAKE IT SIMPLE, EASY IN UNDERSTAND AD EASY TO USE

The entire design process is for the benefit of the user. The user should not have to be taught how the navigation scheme and media controls work; they should be intuitive. From the moment the first screen appears and throughout the interactive process, users should know where they are and where they can go. The initial screen should provide an indication of what is contained in the title and how to navigate through it.

Metaphors should be within the user's frame of reference and consistent with the content. All of the screen images including icons and pointer symbols as well as the navigation process should complement each other and be consistent with the title's theme.

BUILD IN CONSISTENCY

Consistency is especially important for reference titles in which the user is searching for specific information. Consistency applies to both the appearance of each screen and how the navigation scheme works. The graphic in the first screen that is used to navigate to the second screen becomes the background for the second screen. This not only provides unity among various screens, but helps the user understand the navigation process.

USE DESIGN TEMPLATES

A template is a precise layout indicating where various elements will appear on the screen. Templates can aid the design process in several ways:

- **Provide consistency:** Each element of the screen will be in the same location, which aids the user in understanding how the title works and increases the speed at which the user can navigate through the title.
- **Shorten the development time:** Given the similarity of many screens, templates can reduce the amount of time needed to arrange elements on the various screens.
- **Prevent “object shift”:** An object that moves even one pixel as the user navigates through the title causes a noticeable and disconnecting jump. Templates that utilize grids can specify the exact layout, down to a pixel, of each screen element and prevent objects from shifting.

PROVIDE FEEDBACK

Interactivity is a two way process. Users need to know when a button has been clicked – it should change to a depressed state, change color, or play a sound. Users also need to know when an object has been selected – it should appear highlighted, a different color, or surrounded with a border. Another form of feedback is shown, where check marks are used to indicate where the user has been or what has already been viewed.

PROVIDE CHOICES AND ESCAPES

Avoid long introduction of automatically scrolling text, narration, music, or credits. Don't make the user view a video or animation, or listen all the way through sound clips that may already have been heard. Provide a way for the user to skip or escape from viewing these elements. Additionally, care should be taken in the use of Quit button. To avoid accidentally quitting, a prompt should appear when the Quit button is selected to allow the user to confirm the desire to quit.

PRODUCING MULTIMEDIA TITLES

Production is concerned with preparing the multimedia title for use either as part of presentation (sales, education, conferences), or for in house training, kiosk delivery, or CD-ROM distribution.

If the title is for presentation, it may simply be stored on the hard drive of a presentation system or even fit on a floppy disk. It is convenient to store in house presentations and training using CD-ROM.

Compact Disc

The compact disc (CD) provided the technological advance that revolutionized the multimedia industry in a way similar to the effect the printing press had on publishing. The CD allowed developers to provide interactive features-rich titles relatively easily. Compact discs offer many advantages:

- **Large storage capacity:** CDs can hold more than 50 megabytes (MB) of data and 74 minutes of audio.
- **Durability:** CDs are made of rigid plastic that is more sturdy than that used for floppy disks and tapes.
- **More difficult to copy:** Unlike floppy disks, which are easily copied, CDs cannot be reproduced without expensive equipment.
- **Ease of distribution:** Because of the light weight, size, durability and non-volatility of CDS, they are easily distributed individually or in bulk.
- **Non-volatility :** Unlike magnetic storage media (tapes and floppy and hard disks), CDs utilize laser technology that physically alters the surface of the disc.
- **Low cost:** Compact discs are relatively inexpensive to produce compared with other media, such as floppy disks, hard drives, and removable storage cartridges.

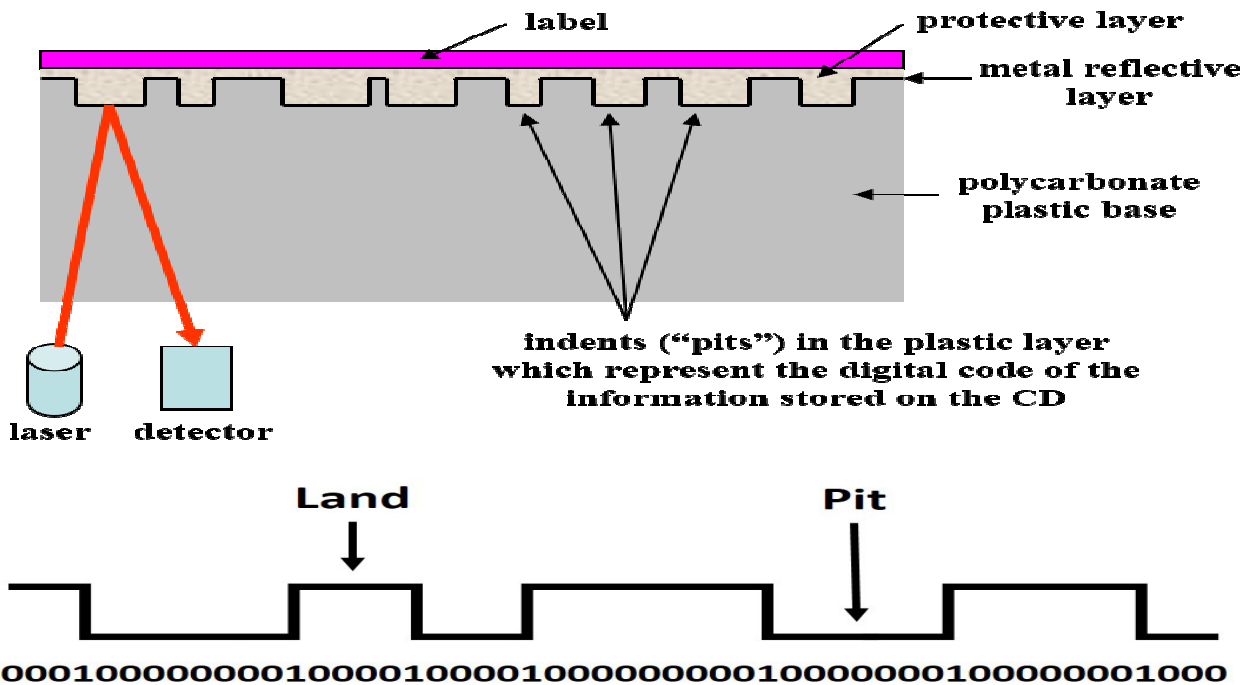
Disadvantages of CD ROM

1. CDs access time is very slow compared with hard drives. (145 milliseconds compared with 12 milliseconds (ms)).
2. Many old computers do not have CD drives.
3. CDs are ready only. User cannot write to the CD.

CD STRUCTURE

In order to understand the differences in CD formats, you need to be familiar with the basics of a compact disk. A CD is 4½ inches in diameter, about 1 millimeter (mm) thick, and can hold approximately 650 MB of data. It consists of plastic coated with a thin layer of aluminum, which is in turn covered with lacquer. During the production, “pits” are created

on the disc using a molding process; between the pits are areas called “lands”. Together pits and lands represent the digital coded data on the disc. When a laser beam is passed over the disc, the light is reflected by the lands and not by the pits. The reflected light is read by a sensor, and a signal is sent to the computer, which translates the signal into binary code. The pits and lands form a spiral track more than 3 miles long that starts at the inside (hub) of the disc and continues to the outside edge.



CD FORMATS

Following is a brief overview of several CD formats.

1. CD Audio

The first widely used compact discs were music CDs that appeared in the early 1980s. CD Audio, or CD-DA, stands for compact disc – digital audio, the format for storing recorded music in digital form, as on CDs that are commonly found in music stores. The Red Book standards, created by Sony and Phillips, indicate specifications such as the size of the pits and lands, how the audio is organized and where it is located on the CD, as well as how errors are corrected. CD Audio discs can hold up to 75 minutes of sound. To provide the highest quality, the music is sampled at 44.1 kHz, 16 bit stereo.

2. CD ROM

The Yellow Book standards built upon the Red Book, adding specifications for a track to accommodate data, thus establishing a format for storing data, including video and audio, in digital form on the compact disc. CD-ROM also provided a better error checking scheme, which is important for data.

3. ISO 9660

In 1985 representatives from several influential companies in the technology industry, including Microsoft, Apple and Sony, met at the High Sierra Hotel in Reno to establish standards that would allow CDs to be played across various computer platforms like Macintosh, Windows and UNIX based computers. The results of this meeting became known as the High Sierra standards, which shortly thereafter were modified slightly and adopted by the International Standards Organization as ISO 9660.

4. CD-I

Developed by Phillips in 1986, the specifications for CD-I, which stands for compact disc-interactive, were published in the Green Book. CD-I is a platform specific format; it required a CD-I player, with a proprietary operating system, attached to a television set. One of the benefits of CD-I is its ability to synchronize sound and pictures on a single track of the disc.

5. CD-ROM XA

CD-ROM extended architecture, or CD ROM XA, was developed by Microsoft, Phillips, and Sony in 1988. This extension of the CD-ROM format allows for interleaving data to enhance the playback of sound and video. It provides the same benefit of better synchronized sound and pictures but it works with computer.

6. Photo CD

The Photo CD was developed in 1992 by Kodak as a means of storing and viewing photos, slides, and film transparencies. The process involves scanning the photos with a high end scanner, compressing the images, and writing them to a compact disc. More than 100 photos can be stored on a CD. The images are indexed, and thumbnails of several images can be displayed at one time. The most common use of the Photo CD is for archiving images and incorporating them into CD titles.

Kodak created multisession disc. During the process of creating a multisession disc, a particular directory structure is created that provides access to each session's data.

7. CD-R

CD-R short for compact disc-recordable, the CD-R file format allows single CDs to be produced using a desktop CD ROM recorder. The CD-R format is also referred to as compact disc-write once, or CD-WO. Compact disc recorders are laser based systems that create one CD at a time – referred to as a **one-off**.

The CD formats were developed specifically for a large market; business, education and consumer. The following are some everyday examples of practical uses of the CD-R format:

- Archiving printed material by scanning it into the computer and writing it to a CD
- Providing in house multimedia training titles
- Distributing information to a small, select audience
- Creating a prototype of a CD title for testing
- Creating a premastered image file for delivery to a company for mastering and replication.

THE PRODUCTION PROCESS FOR CD-ROM

This process involved in creating CD-ROMs for mass distribution. The production process involves premastering, mastering, replication labeling and packaging.

PREMASTERING:

The purpose of premastering is to create an exact image of what will be placed on the CD in an ISO 9660 or other CD format. The image file will include the data, filenames and directories, error detection and correction routines, indexes, and programs that become part of the finished CD.

Premastering involves the following steps.

- **Organizing and naming the titles:** The file must be organized and named in such a way as to be compliant with the desired CD format. For example, ISO 9660 specifications allow only eight levels of directories, and the filenames must conform to the MS-DOS naming conventions.
- **Optimizing the file structure:** This is necessary to speed up the retrieval time. Related files should be placed physically together on the disc. Those files that will be used often should be located near the beginning of the disc, where access time is the shortest. Those files that will be used infrequently, such as install programs, should be located near the outer edge of the disc.

- **Simulating a CD using a hard drive:** Retrieval time for a hard drive is faster than for a CD and testing a multimedia title using a hard drive might not uncover performance shortcomings of the CD. There are mastering programs that will simulate the CD drive's seek and access time on a hard drive, allowing you to test the file structure for optimization and to determine problems that need to be corrected.

MASTERING AND REPLICATION:

The next step is to create a master disc—a process known as **mastering**. Because of the cost of equipment, this is usually done by companies specializing in disc replication. Using a laser, the information on the mastered image file is burned onto a glass disc that has been covered with a light-sensitive material. The material is washed away, leaving pits and lands. The glass master is then used as a mold to create a stamper, which in turn is used to create the actual CDs. Once the stampers have been developed, the **replication** phase begins, and hundreds of discs per hour can be created.

LABELING AND PACKAGING:

Labeling the CD is done through a silk-screening process. The label usually contains the name of the title, the name and logo of the company that developed the title, copyright information, and graphics. Graphics are an important part of the CD because they can add to its marketing appeal.

Packaging allows for bundling several items together, as well as aids in the marketing of a product. Some CDs need to be packaged in a large box because they require reference manuals or other documentation. Other CDs are packaged in a large box to help in merchandising the title. Large packages give the perception of added value, are useful in attracting attention on the retail shelf, and can provide sales information. The clear plastic jewel box has become a standard because of its relatively low cost, superior protection and marketing features. This material can be used for promotional purposes by utilizing graphics to attract potential customers. It is also useful in providing important information such as the computer system specifications required to run the CD.

DISTRIBUTING MULTIMEDIA TITLES

Developers create the title and prepare it for mastering and replication. Publishers are involved in the marketing and particularly the distribution of multimedia titles. In many cases, the same company both develops and publishes the title.

DISTRIBUTING MULTIMEDIA TITLES ON CD-ROM

Marketing Consumer Titles:

Multimedia publishers face several market-related hurdles that must be overcome. First, the industry is new and most consumers have little or no experience with multimedia titles. Consumers are reluctant to spend money on something they are few sources for reviews, previews, or ratings of multimedia titles. Most retailers are not set up to demonstrate CD-ROM titles. There has been a high rate of returns of CD-ROMs by first time buyers who purchased a title and then were unable to run it on their computers. Retail employees may not have the training to assist customers with technical problems. There is a lack of good content. There are too many CD-ROM titles vying for too little shelf space. To overcome these hurdles, a publisher must develop a marketing plan that involves coordinated product, promotion, pricing, and distribution strategies.

Product Strategy:

Multimedia development companies realize that creating only one product, will not sustain a company in the long run. Companies develop mission statements that often include goals of becoming leaders in a particular field. In a highly competitive field, a company's multimedia titles must be differentiated from the others. One way to differentiate would be to create a character such as Arthur in the series of titles put out by Living Books. Each of the Arthur titles has the same "look and feel", objectives, main character, and theme. Another way to differentiate a product is by creating high quality graphical images, rich content, or expensive elements such as 3-D animation and video.

Another product strategy is to develop brand-name recognition by the target market. Startup companies must adhere to certain development standards and specifications and by entering into a licensing agreement with Microsoft to generate confidence in the consumer by association.

Whatever product strategy is used influences and is influenced by the publisher's strategies for promotion, pricing and distribution.

Promotion Strategy:

Retailers are more inclined to stock a title that has an aggressive promotional plan that includes an advertising campaign, point-of-purchase material, and publicity. They are interested in advertising that will stimulate demand for a product and pull the customer into their store. The question is: Who pays for the advertisement? One technique is for the retailer and the publisher to share the cost through a cooperative advertising program.

Point-of-purchase materials such as aisle displays can be tied in with an advertising campaign and are useful in encouraging impulse buying. Aisle displays can increase the sales of product by 25 percent or more, even if the price is not lowered. Point of purchase displays must be designed, manufactured, and shipped to retailers, however, and there may be no guarantee that the displays will be set up and maintained by the retailer once they are received.

Publicity comes from stories that appear in various news media. For multimedia titles this is usually magazine, newspapers, and trade publications. The stories often appear as reviews of new products. It is unbiased and therefore lends credibility to the reviewer's conclusions. It can be leveraged by including reviews in advertising, on point-of-purchase displays, and on packaging. It can be directed towards desired audience. Publicity is free. In order to generate publicity, multimedia publishers prepare and distribute to selected reviewers press kits containing product information and a full version of the title.

Pricing Strategy:

Prices for CD-ROM titles for the home market steadily declines from the \$70 to \$90 to around \$20 to \$50. Pricing is heavily influenced by cost and competition. Traditionally, companies have determined a suggested retail price (SR) and provided discounts to different buyers. Wholesalers might receive a 50 percent discount and retailers a 35 percent discount off of the suggested retail price, which is usually above the street price – the price actually paid by the consumer. This is one reason why retailers stock only the best-selling titles.

In many cases, publishers have not approached the pricing of their products in a way that will cover their entire costs. Some have included only development and production costs and not provided for marketing costs or company overhead.

Distribution Strategy:

Multimedia is a new industry that affects many fields: entertainment, video, music, computer, and education, to name but a few; and it involves many players book publishers, film producers, software companies, small multimedia developers, and so forth. A CD-ROM publisher has several options when determining how to distribute consumer multimedia titles. The ultimate test of a title is its demand, and sales are heavily influenced by retail exposure, advertising, and point-of-purchase display.

In some cases, company sells directly to retailers. Whatever model is used, there needs to be a value-added effect as the product moves through the distribution channel; that is, every link in the distribution chain needs to make some contribution to the product and its perceived value to the consumer. The following are the pros and cons of the various distribution models.

Wholesalers:

Wholesalers buy from multimedia publishers and resell to others, including retailers, catalog companies, and corporate and education markets. Wholesalers can provide services such as controlling inventory, processing returns, and giving technical support. A primary benefit for multimedia publishers, that wholesalers offer access to a worldwide network of retailers. There are a few large wholesalers that specialize in computer related products, including hardware, software, and accessories.

There are drawbacks to using wholesalers. Because wholesalers carry thousands of products, there is little likelihood that they will actively promote any one CD-ROM title or work to obtain retail shelf space.

Retailers:

One of the best ways to reach the consumer market is through retailers, although a typical retail outlet may stock only 100 to 200 titles out of the thousands that are published each year. A retailer selling CD-ROM titles is interested in maximizing sales per square foot of floor space by increasing inventory turnover. Thus, a primary criterion for stocking a particular title is demand.

Forecasting demand for a new title is risky. There is extreme price competition. Retailers are also hesitant to do business with a company that has only one or two products. Retailers often obtain market development funds, called slotting fees, from publishers to stock a title.

Superstores and Specialty Retailers:

Originally, CD-ROM titles were sold through computer stores. This was because those who had computers shopped at these outlets for software. Eventually, mass merchandisers began carrying CD-ROM titles. Now book, toy, video and music stores as well as other specialty retailers are selling multimedia titles. More than 25 percent of independent bookstores carry CD-ROM titles. They average about 50 titles per store and focus on reference and children's titles. Specialty retailers offer a good distribution alternative for multimedia publishers, especially when the retailer's customer base matches the publisher's target market.

DISTRIBUTION ALTERNATIVES

These include direct, bundling, catalog sales, rentals and partnerships.

Direct Mail:

Publishers may find that mail order sales is a cost effective way to enter the market, especially if mailing lists are available for their target audience. Mailing lists, as well as printing and mailing costs, are relatively inexpensive when compared with other advertising media such as newspapers and magazines. Purchases by 5 percent of those receiving a mailing are typical. The important thing is that the mailing list matches the target audience.

Bundling:

Bundling involves the distribution of a multimedia title with some other product such as a new computer or upgrade kit. This type of distribution is called OEM marketing, because the publisher works with the “original equipment manufacturer”. The advantage for the publisher is that essentially no marketing costs are involved other than negotiating with the hardware manufacturer. A disadvantage is that the large discounts required leave very little return on each unit.

Catalog Sales:

Several companies, such as Micro-warehouse, PC connection, and Multiple Zones International, publish monthly catalogs of computer hardware, software, and CD-ROM titles and distribute these to selected markets. Multiple Zones, for example, publishes the Mac Zone and the PC Zone as well as corporate, education, home and international catalogs.

Rentals:

Some retailers are experimenting with renting CD-ROMs. Blockbuster, a national chain of video and music stores, rents and sells CD-ROM game and entertainment titles. Publishers who are considering allowing their titles to be rented need to consider the effect on sales.

Partnerships:

With the incredible growth of multimedia developers and the distribution problems facing them, it is surprise that partnerships, joint ventures, and acquisitions are fairly common. Many of these bring together a developer and a distributor or content expert. This minimizes the developer’s marketing costs and allows the developer to concentrate on creating titles. Financial arrangements vary from having a distributor fund that development costs to licensing a title and paying a royalty on each unit sold.

MARKETING NON CONSUMER TITLES

Non consumer titles, such as reference works used by libraries, corporate training title, and educational titles directed at the college market, make up the vast majority of CD-ROM sales. They are less complex to market than consumer titles, do not require shelf space, and are not as prone to seasonal sales. This target audience is usually smaller, more defined, and easier to reach. Large wholesalers who sell to retailers, also have corporate divisions. Other distributors such as Software Services, specialize in sales to educational institutions or government agencies. Because of the fewer number of potential buyers, telemarketing and direct mail campaigns can be effective. Trade shows that allow vendor demonstrations are also a useful way to reach specific industries.

DISTRIBUTING MULTIMEDIA TITLES ONLINE

In April 1994 there were 1,000 sites on the Internet. Eighteen months later there were 110,000 sites. In 1996 there were more than 20 million people worldwide who had access to the Internet. One prediction is that this number will exceed 50 million by the end of the century.

The Internet is quickly becoming a major delivery medium for multimedia. The World Wide Web provides all of the elements of multimedia, including sound, animation, video and Hyperlinking – and the content can be updated as often as desired. Thus the advantage of online distribution is the vast audience and the ability of the developer to constantly refresh the content to keep it timely. The drawback of delivering multimedia online is its slow speed. The fastest commonly used modems transfer data at a fraction of the speed of CD drives, so a major disadvantage of distributing online is the inability to deliver large files quickly. On the other hand, although the information on a CD-ROM can be accessed relatively quickly, once a CD is mastered no data can be added. This means that whatever is on the CD when the user obtains it will not change.

Thus the Internet and CD-ROMs are complementary – the strength of one overcomes the weaknesses of the other. For example, Microsoft's reference title Complete Baseball provides historical data and team and player statistics. Those who have registered copies of the CD-ROM can access daily game updates. This distribution process has significant value for the education and corporate training markets. An online course could be developed and a CD-ROM sent to those who enroll. The CD-ROM would have course materials such as case studies, reference works, tests, tutorials, virtual labs, and other tools. The online component would allow instructors to give assignments involving material on the CD-ROM, establish "chat rooms" for student discussion, and update and augment materials as needed.

If a publisher includes online distribution in the marketing mix, a decision needs to be made on how to structure the online connection. The developer could install a server and

establish a home page that could be accessed by users, but consideration would need to be given to how the system would be maintained and how often the content would be updates.

Kiosk – based Multimedia

A kiosk is a computer-based system used to provide information and conduct transactions. The most widely used kiosks are bank ATMs. Kiosks are a good medium for multimedia because they can be configured to accommodate the needs of the user and the developer. For example, a videodisc or a large hard drive could be added to the system to accommodate video, a printer could be part of the kiosk to provide a hard copy of desired information; and if the content needed to be updated.

There are two types of kiosks, informational and transactional. Transactional kiosks provide for user input. Examples of transactional kiosks are ATMs, school registration systems, and airline self ticketing systems. In most cases the user must enter information in order to complete a transaction. An input device such as a keyboard, numeric pad or card reader may be necessary. Fortunately, a touch screen can display a keyboard, so no peripheral unit is needed.

Informational kiosks are those found in shopping malls, libraries, and museums, which allow the user to access information such as store location and hours; city services and employment opportunities; and art collections and artist biographies.

The success of a kiosk is to a large extent determined by its location; it needs to be accessible to the intended audience. In most cases, this means locating the kiosk in a high traffic area that is convenient to the potential user. Shopping malls, college bookstores, bank buildings, airport terminals, libraries, and museum lobbies are examples of practical locations. The kiosks location will often have an effect on its features. For examples, sound might be considered a desirable element that could be used to attract people to an amusement park kiosk, but if the kiosk were located in a library reading room, the use of sound would be inappropriate.

UNIT V – MULTIMEDIA ISSUES AND FUTURE OF MULTIMEDIA

What are the Internet and the World Wide Web ?

The Internet is a vast communications system linking computers around the world. When two or more computers are linked together, it is called a network. Networks are often configured with a more powerful computer, called a server, that controls the network and provides a large storage capacity. The other computers on the network, called clients, allow users at remote locations to access the programs and data on the server. Businesses, government agencies, schools, and other organizations have been using networks for decades. Networks allow individuals within organizations to communicate and share information. The Internet is a network of networks. It was originally developed by the U.S government and educational research institutions. The Defense Department, was interest in having a communications system that would link together different types of computers and allow government sponsored research to be shared. Universities were interested in having a communications system that would assist in collaboration on research projects and dissemination of research findings.

First was the development of two computer features; a visual interface that, with a browser, allowed the user to easily search for information; and a formatting standard specifically designed for the Internet, called Hypertext Markup Language (HTML). Initially internet was text based. There were no photographs, sounds, animations or video. In 1993 a program called Mosaic was developed and became the first popular visual interface that could be used to display web pages. Web pages are documents that are written in HTML and form the basis for the World Wide Web. HTML allows multimedia to be incorporated into the Internet by providing Hyperlinking and the ability to use sound, animation, video and graphics on a web page.

When a new opportunity such as the WWW draws the attention of business, there is an enormous amount of money directed toward creating. The following are just some of the unique job descriptions and industries that arose as a result of the commercialization of the Internet:

- **Software developers:** The development of software included creating browsers such as Netscape and Microsoft Internet Explorer; which are used to interpret and display HTML documents; creating development tools such as PageMill and Front Page, which are used to create HTML documents and manage web sites; and creating utilities to allow current applications to run over the Internet, for example, Shockwave, which allows Macromedia Director movies to be delivered via the web.

- **Service Providers:** These companies provide individuals as well as businesses and organizations access to the Internet and its World Wide Web components.
- **Communications companies:** This industry focuses on establishing the infrastructure necessary to provide Internet access throughout the world and to increase the speed of the network.
- **Web specialists:** These people specialize in the development and support of web sites. They include webmasters, network & technicians and multimedia developers focusing on creating material for the web.

With very little training and only a small monthly fee, an individual could create, place and maintain a home page – a web page that serves as your main menu or home base on the web.

Multimedia on the World Wide Web

The world wide web part of the Internet has multimedia capabilities. Browsers such as Netscape Navigator and Microsoft Internet Explorer that interpret HTML documents allow graphics, sound, movies and animation to be delivered to the user. Hypertext Markup Language allows developers to include Hyperlinking in their web documents, giving the user the ability to “navigate” from place to place in a document. An important advantage to develop multimedia applications for the WWW is that web documents are created using HTML standards. There is no standard computer platform and no standard hardware required to run the application on the Internet.

Limitations of the Internet

- First, the transfer process can be completed more quickly by using compression. Files are compressed before they are sent to the user’s computer and then decompressed as they are needed. In fact, the standard graphics file formats for the web are GIF and JPEG, which are automatically compressed when they are created. GIF stands for Graphics Interchange Format and is the prevalent graphics format for images on the web. JPEG, short for Joint Photographic Experts Group, the organization that created the standard, is used to digitize still photographic images.
- Second, a combination of CD and Internet delivery would allow the user to access large files from the CD and other information from the web. An example would be a college class in which a CD is distributed to each student. The CD could contain video clips, 3-D animations, and other large files that are displayed more quickly from a CD than if they were delivered over the web.

- Third, developers should consider using multimedia elements and development techniques that minimize file sizes. Such shortcuts include using animations instead of video clips, 2-D rather than 3-D animation and 8 bit rather than 16 bit color and sound.

There are alternatives to using a modem with standard phone lines that are in use or under development. These include the following:

- **Cable modems:** These utilize the coaxial television cable and provide speeds up to 100 times faster than modems using telephone wires.
- **ISDN :** short for Integrated Services and existing telephone cables to provide speeds of up to 128 Kbps.
- **T1 lines:** These are leased telephone lines that provide speeds at 1.5 Mbps.
- **T3 lines:** These leased telephone lines provide speeds of 44.7 Mbps.

All of these techniques can provide faster transfer of data, and companies and organizations use them to connect their intranets as well as to connect externally to the Internet. Intranets are internal organization networks that look and function like the Internet. Companies set up an intranet for a number of reasons:

- To provide a way for employees to collaborate on projects
- To provide access to company information such as sales or new product data
- To announced new policies or company events
- To deliver multimedia training materials

Developing Multimedia for the World Wide Web

HTML is used to format the appearance of a document and to create links that allow the user to navigate throughout the document. Formatting, such as centering a heading or underlining a word, is done through the use of tags.

Creating hyperlinks using HTML requires identifying the element that is to be linked and the destination for the link. When the user clicks on the word, the linked document is displayed. HTML also allows a developer to easily insert graphics into a document. Creating an HTML document is as easy as using a word processor to type the text with the formatting codes or using an HTML editor to insert the codes automatically. HTML has limited capabilities, however, and required a programming language like Java to produce sophisticated features such as creating animations and search a database. Java, developed by Sun Microsystems, has become popular for programming web related applications. It is a powerful language and is used to extend the functionality of HTML. Java could be used to

create an application that tracks stock prices and periodically displays them on a web page. Such programs, called applets, are developed for one specific purpose and like template can be used in more than one application.

Another consideration when programming for the web is the Common Gateway Interface (CGI), a coding standard that allows programmers to write applications in various languages for the web. CGI programs run on the server and provide a way for server based programs to obtain information from a user and return information to the user. A typical application is one that allows the user to search a database.

Using the Web as a source of Multimedia Material

The World Wide Web is an excellent source of clip art, sound and video clips, and photographs that can be used in a multimedia title. Virtually every company that provides these elements has a web site and offers the ability to search its database for the desired material, pay for it, and often download it from the web. PhotoDisc website has more than 50,000 digital images in categories such as People and Lifestyles, Science, Technology and Medicine, Nature, Wildlife, and the Environment and Business and Occupations. You can search and download images as well as order from the CD-ROM collection and obtain a company catalog.

An example of a website for music and sound clips is the Multi Media Music site (www.wavenet.com) developed by Partners in Thyme. The site provides high quality audio for computer presentations and multimedia projects and includes sound utilities for the PC, sound effects, and music loops.

An example of a website with video clips is Four Palms (www.fourpalms.com). This site has royalty free video clips in AVI, QuickTime and MPEG formats.

Another way to locate multimedia materials is to search the web using one or more of the search engines. Whenever the web is used to obtain material such as sound clips or graphics images, care should be taken to ensure that copyright laws have not been violated.

Viewing Multimedia on the Web

When developing multimedia for the web, you need to understand how multimedia elements are viewed when delivered via the Internet. If you develop a multimedia title with sound, animation and video, for example, place the tile on a CD, you could specify the configuration need by the user (MP3 PC). Web pages, however, are viewed with web browsers, which are limited in their ability to automatically display certain files, including various image types as well as animations, video and sound clips. Macromedia Director is a

popular program for creating animations. A Director “movie” can be saved in a format that allows it to be played directly from a CD. In order to play a Director movie from the web, an additional program – shockwave needs to be installed on the user’s computer.

There are two types of programs that are used to view elements not viewable with a browser alone: helper applications and plug-ins.

Helper applications display an element (such as a video clip) in a separate window on the user’s monitor. A **plug-in** (such as Shockwaves) displays an element as though it were part of the browser. Because helper applications run independently, the user must download the application onto a hard drive and then configure the browser to use the application whenever a particular kind of file is encountered.

Animation on the Web

Incorporating animation is an excellent way to increase the appeal of a website and help ensure return visits. Animations can be as simple as blinking text, marquee like scrolling headlines, rotating logos, and 2-D action figures or as complex as 3-D virtual reality environments with user control.

Animated text: Using the HTML <blink> tag, you can cause text to flash on and off. To have the words YEAR END SALE blink in the webpage document, you would include the following HTML code : <blink>YEAR END SALE</blink>. Another way to animate text is by using a scrolling or marquee type action to scroll text across the screen

Animated GIF: The GIF graphics file format is a standard for the web GIFs are still images that can be combined to create an animation. A program called GIF Builder allows you to create an animation by displaying a series of GIF file. GIF Builder includes features for adjusting the speed of the animation and how many times it is played.

Director movie: A Director animation can be played using the Shockwave plug-in. This is a way to create somewhat sophisticated animations and have them delivered via the web.

3-D environments: The computer language used to create 3-D environments on the web that allow the user to move through a space or explore an object is called Virtual Reality Modeling Language (VRML). VRML technology is especially useful in creating games and educational titles. You need a browser that supports VRML or a plug-in to display VRML applications.

MULTIMEDIA ISSUES

1. COPYRIGHT ISSUES :

The laws of copyright are designed to protect intellectual property rights and provide potential monetary rewards for inventiveness and hard work. In this way they foster creativity. However, the ease with which material can be copied, digitized, manipulated, incorporated into a title, and delivered to a mass market has prompted concern about the adequacy of existing copyright laws as they apply to the multimedia industry. Consider the following:

- Videotapes and videodiscs can be rented and played on a VCR or videodisc player linked to a computer, allowing the images to be captured and digitized.
- TV programs can be captured from a television connected to a computer.
- Scanners are used to digitize printed material, photographs, and slides.
- Computers equipped with audio cards can capture and digitize music and other sounds from CDs and audiocassettes.

Once in digital form, any number of changes can be made to images and sounds, The Mona Lisa can be given blue eyes, a Kenny G sound clip could be synchronized with Mickey Mouse playing the saxophone. All this can be done from the desktop.

Business models providing licensing agreements and royalty fees have been in place for many years to provide protection and payment to those in the music, movie and publishing industries. Copyright holders are leery of how multimedia developers can so easily manipulate digitized material and how quickly and widely it can be distributed, especially over the Internet.

There are several options available to a multimedia developer for obtaining content, including acquiring rights to copyrighted material, utilizing non-copyrighted or public domain material, creating the material in house, or contracting for original material.

Acquiring Rights to Copyrighted Material

Simply purchasing a videotape or music CD does not authorize the buyer to copy a video or sound clip. No rights beyond personal use are provided. In order to use copyrighted material, a developer must determine which rights are needed. This can be complicated. For example, obtaining the right to use a video clip does not necessarily mean you have the right to use the music or a particular character in the video, nor does it necessarily mean that you can use the video clip in both a CD-ROM and on the Internet. These may require separate

licensing agreements. In addition, there may be restrictions on granting permission to use copyrighted material, such as for nonprofit applications only.

After determining which rights are needed, the developer must identify who has the ability to convey them. In the music industry, a song writer may hold the copyright, but it is usually administered by a music publisher, who in turn may employ an agency to negotiate and collect license fees. Despite these organizations it is sometimes necessary to locate an individual who holds the copyright (author, artist, singer or photographer) and negotiate the desired rights.

Using Material in the Public Domain

Materials that have no copyright are said to be in the public domain and can be used without permission. Either no copyright was issued, the copyright has expired or it was not renewed. There may be legal considerations when using public domain materials, especially those related to derivative works, trademarks, and people.

Derivative works are based on an original work, such as translations, abridgements, adaptations, or dramatizations. A **trademark** is a name, symbol or other device identifying a product; it is officially registered with the U.S. government, and its use is legally restricted to its owner or manufacturer.

Trademark protection covers the title of a publishable work and, in the case of fiction, often the name of its characters. The rights of individuals include what's known as the Right of Publicity; this is a legal basis for requiring permission and payment for using a person's name, image, or persons.

2. PRIVACY ISSUES

In 1994 a CD-ROM was distributed that contained more than 2 million Oregon driver's license records, including each person's vital statistics and Social Security number. Marketing departments from any number of companies would be interested in obtaining information provided on a driver's license, such as name, address, birth date, and gender. Although this may not be a technical violation of privacy laws, it does point out how easily personal data can be obtained and distributed.

Laws dealing with privacy include two issues that are important to multimedia developers. First, revealing embarrassing facts about an individual that would be considered offensive to a reasonable person and where there is no sufficient cause for the disclosure may violate privacy laws. For example, revealing that an individual had a substance abuse problem 20 years earlier may constitute an invasion of privacy.

Second, placing a person in a false light which causes undue stress on the individual could also constitute a violation of privacy. For example, showing a video clip of a woman walking in front of an adults – only theater on a dark, deserted street may imply she is a prostitute, when in fact she may have merely lost her way in an unfamiliar city.

3. CENSORSHIP ISSUES

Controversy over the content of CD-ROM titles is essentially no different than other media. Pornography, violence, and racism are as much a concern in multimedia as in television, movies, and music. This is especially true of titles, such as games, that may be directed toward children. Should censorship – the official and authoritative examination, and possible expurgation, of material for appropriateness of content – be applied to multimedia titles? If so, the question becomes: who will control the content – the multimedia industry or the government? The movie and music industries have rating systems and labeling to provide the consumer with an indication of the appropriateness of the content for various audiences. Potential consumers of CD-ROM titles usually have little more than the company’s promotional material on the package to inform them of the content and its appropriateness for a particular audience.

The issue of censorship in multimedia will intensify as titles become more prevalent on the Internet. The Internet provides the opportunity for developers to deliver their titles to users without the need of a publisher, distributor, retailer, or other intermediary. Being “socially responsible” however it is defined – will become more and more the purview of the multimedia developers.

TRENDS IN THE MULTIMEDIA INDUSTRY

- 1. The Internet:** The Internet is having a dramatic effect on the delivery of multimedia titles. The rush to the Internet has caused some people to predict the demise of the CD-ROM. The CD-ROM has a limited storage capacity and its content is unchangeable, whereas the Internet promises to provide virtually unrestricted, easily updatable information. Even though multimedia elements can be conveyed over the Internet, a major problem is the slow speed for delivering large files – especially video, sound, and animation. The connection from the server containing the title to the home or office computer does not provide enough bandwidth to accommodate the large files. Bandwidth is the capacity of a device to process or transmit information, the more information it can handle per second, the greater its bandwidth. The

technology to increase the bandwidth, including cable modems and ISDN lines, is available; the problem is the costs involved in deploying this technology.

HARDWARE

- 2. Multimedia Processor:** A new generation of processor chips that include Multimedia Extensions (MMX) technology has been developed by Intel to increase the performance of computer video, audio, communications, and graphics. The technology allows the processor to work on different data elements at once, increasing the overall work the processor can do. This results in richer colors, more vivid sounds, and smoother animations and video. The chip will be able to handle such tasks as graphics acceleration, sound and video decompression without add-on cards. The processor will take advantages of Microsoft DirectX technologies, which include DirectSound, DirectDraw, DirectInput, Direct3D, DirectMIDI, DirectMPEG and DirectPlay. This could improve the performance of multimedia operations by as much as 400 percent.
- 3. DVD (Digital Video Disc):** The DVD represents a major advance in CD technology. The DVD dramatically increases the capacity of CDs from 650 MB to as much as 17 GB. This allows full length movies with different audio tracks, and even different versions of the same movie (PG, PG-13, R) to be available on one disc. The technology involves increasing the data density by reducing the size of the pits and lands and providing double layered and double sided discs. As the cost of the drives decreases so that households can more easily afford them, the movie industry and the multimedia game developers who required large disc capacity will benefit as well.
- 4. CD-E (Compact Disc Erasable):** Phillips Electronics has developed the CD-E – an erasable disc that allows a user to update information on the disc and free up disc space by deleting unneeded data. A CD-E drive will be able to read, write and overwrite erasable discs. In addition, these drives will be capable of reading all existing CD formats, such as CD-ROMs and Photo CDs. Erasable CDs will be especially beneficial in multimedia development environments, as well as to those needing to exchange data archive large amounts of data, and back up data stored on hard drives.

DEVELOPMENT

- 5. Target market:** Because the intense competition in the consumer market, the emphasis for multimedia titles will focus more and more on the corporate market. Corporate training is a multibillion dollar industry, and companies are realizing that multimedia training delivered in a lab setting, through a company network to the desktop, or to the factory floor using a kiosk can be more timely and cost effective than classroom instruction. Corporate marketing, including CD-ROM or online catalogs, distribution of CD-ROM promotional titles, and multimedia based presentations, is another area that will attract developers. Every major advertising agency and many specialized agencies have a multimedia department eager to tap into this growing market.
- 6. Content:** For those developers who choose to focus on the consumer market, the emphasis will need to be on quality and content. Consumers will demand that best quality graphics, especially 3-D animation, sound and video. This will force up product development and marketing costs. Creativity and storytelling, wherein the user can interact by taking the perspective of different characters and influence the story, will be more prevalent; and more titles will use live actors as the Hollywood storytellers become more influential in the multimedia industry.
