In this unit you will be introduced to the concept of multimedia. You will learn what multimedia is and why it has become so pervasive. You will learn about the elements that make up multimedia and how interactivity is a necessary part of multimedia. You will learn how easy and fun it is to use multimedia. You will discover that multimedia is freeform and that it is limited only by the reader’s imagination. In addition, you will see examples of multimedia in a variety of settings and using various delivery modes. The unit also presents a study of the computer systems used in the playback and development of multimedia applications. Finally, the unit addresses the issues of privacy and development standards.
Defining multimedia

In a generic sense, multimedia is simply the use of many media. Thus a speaker making a presentation using a slide projector and VCR is giving a multimedia presentation. Today, however, the word “multimedia” is generally meant to apply to a broad spectrum of computer-related products and processes. You have encountered multimedia if you have visited music stores on the Web where you can listen to a music clip and then make a purchase or if you have played interactive games on the Web. Likewise, you have encountered multimedia if you have used CD-ROM and DVD titles, computer-generated games, interactive kiosks, CBT (Computer-Based Training) materials, instructional courseware, and online services. But what exactly is multimedia? For the purpose of discussion in this book, multimedia is defined as a computer-based, interactive experience that incorporates text, graphics, sound, animation, video, and virtual reality. This lesson provides an overview of multimedia.

**DETAILS**

- **Multimedia elements** include text, graphics, sound, video, animation, and virtual reality. These elements are broad categories that can be subdivided further. For example, the graphics multimedia element includes drawings and photos; the animation multimedia element includes 2-D as well as 3-D. In most cases, a combination of two or more multimedia elements provides the best results when developing multimedia. For instance, using sound narration with a video clip may be more effective in helping someone learn a new concept than using sound or video alone.

- A fundamental feature of multimedia is **interactivity**—that is, the ability of the user to interact with an application. Multimedia allows the content to be presented in a nonlinear way, which allows the user to be active rather than passive. The user determines what content is delivered, when it is delivered, and how it is delivered. User interactivity comes in many forms, including keyboard input, mouse point-and-click, mouse rollovers, voice activation, and touch screens. Figure A-1 shows some of the interactivity that a user might encounter when accessing an online encyclopedia.

- Fundamental to the development and delivery of multimedia is a computer system capable of incorporating multimedia elements such as sound and animation. It also must support an environment in which the user can interact with the program. Figure A-2 shows a typical **computer playback system** capable of delivering multimedia. Today most computer systems are equipped with the hardware and software needed to deliver multimedia. The typical configuration includes CD-ROM or DVD drives, audio cards, graphics cards, speakers, and sufficient speed and processing power to deliver multimedia. Most multimedia computer playback systems include an Internet connection, a browser, and a modem that allows the user to access multimedia applications from the Web.

- **Multimedia applications** is a broad term that covers all uses of multimedia. Examples of multimedia include an online college course Web site that uses 3-D animation to explain how earthquakes occur or an e-commerce Web site that shows video clip demonstrations of its products. **Multimedia titles** refer to specific products, including CD-ROM-based games like Flight Simulator and educational CDs such as Grandma and Me.
FIGURE A-1: Multimedia interactivity

User controls content to be viewed by typing key search term

Hyperlinks to other documents that include the multimedia elements of text, graphics, audio, video, and animation

Hyperlink connects user to information specific to this term

Hyperlink connects user to text, graphic, and audio elements on specific topic

Animation piques user interest

FIGURE A-2: Typical multimedia computer playback system

CD-ROM/DVD drive

Floppy drive

Tower includes:
- CPU
- Audio card
- Graphics card
- Modem

Software

Monitor

Speaker

Keyboard

Mouse

Graphic

Sound clip available

Hyperlink connects user to other documents that include multimedia elements of text, graphics, audio, video, and animation.
Exploring multimedia on the Web

The Internet is a vast communications system linking computers around the world, as shown in Figure A-3. First developed several decades ago by the U.S. government and research institutions, the Internet became widely popular after the development of browsers. A browser is a visual interface that interprets Web documents and allows for the display of graphics. Browsers, such as Netscape Navigator and Internet Explorer, enable graphics, sound, movies, and animation to be delivered to the user. The development of browsers helped spawn the World Wide Web, which supports delivery of multimedia, and provides for hyperlinking of content over the Internet. Together, browsers and the Web give the Internet multimedia capabilities. This lesson looks at multimedia on the Web.

Details

- The fastest-growing area for multimedia delivery is online, including delivery via telecommunications and the Internet. Telecommunications involving phone line, satellite, wireless, 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. Many companies are developing home pages for the Web that allow customers to access product data including video demonstrations, to purchase products, and even to subscribe to news services.

- One of the most compelling features of the Web is its immediacy. Events such as rock concerts, baseball games, and conference keynote speeches can be Webcast—that is, broadcast, in real time over the Web, as shown in Figure A-4. All Webcasts are audio and some include video.

- Animations, as simple as rotating text or as sophisticated as 3-D settings, are an exciting part of multimedia on the Web. They have proved especially useful for attracting attention and creating virtual learning environments. Animations can be created using simple HTML tags, animation software such as Macromedia Flash, or programming languages such as Virtual Reality Modeling Language (VRML).

- The “coding language” for Web documents is called HyperText Markup Language (HTML). Multimedia developers know that as long as their programs are written using HTML, the user should be able to run the application on the Web. Unfortunately, no standard hardware configuration exists for computers linked to the Internet. For example, the user’s computer may or may not include a sound card. If it lacks a sound card, then the user cannot hear sound used in the multimedia application.

- HTML allows Web page developers to include hyperlinks, which consist of text or graphics that are coded to “jump” to another location. Hyperlinks give users the ability to “navigate” from place to place in a document or across documents.

- HTML uses HTML tags to mark text. For example, Welcome! would be coded as <i>Welcome!</i> in HTML. The HTML tags <i> and </i> display all text contained within the tags in italic.

- While HTML is used to create basic Web pages, other programming languages and development software are more appropriate for creating multimedia events. Programming languages, like Java, are used to produce sophisticated features such as animations and database searches. Applets are Java programs that are developed for a specific purpose and can be used in more than one application. For example, an applet might track stock prices and periodically display them on a Web page. Java applets are run within the browser on the user’s computer and are downloaded from the Web when the browser opens a Web page that supports them. A person with programming knowledge can create applets. Applets are also available from commercial developers such as Sun Microsystems as well as third-party developers. Some are available free of charge and can be downloaded from the Web.
Significant considerations when developing multimedia applications for the Web include file sizes and the playback system configuration (hardware and software). Today, most home computers connect to the Internet through modems and phone lines. A standard modem transfers data at a maximum rate of only 56 KB per second; by comparison, a CD may have a transfer rate as high as 7200 KB per second. Thus large files—especially video clips, sounds, and animations—can take an inordinately long time to move from the Web to a home or office computer. Certain techniques, such as file compression, can be used to speed up the transfer process and/or give the developer some control over the process.
Studying the growth of multimedia

Multimedia seems to be everywhere. There are entertainment sites on the Web, children’s computer games, training materials with video clips, and educational material such as this textbook, which has both a CD-ROM and Web site with multimedia applications. The growth in multimedia has followed expansion of the use of computers, technological advances in hardware such as audio cards capable of playing CD-quality sound, and development of software that allows video to be delivered to the desktop computer. This lesson examines factors contributing to the growth of multimedia.

DETAILS

- One indication of the growth of multimedia is the number of households that own multimedia computer playback systems. As shown in Figure A-5, in 1997 only about one-third of the households in the United States had a computer. In just three years, the percentage of households with computers almost doubled. This growth corresponds to a decrease in the price of these computers from $2000 to as little as $500 during the same period.

- Another indication of multimedia’s newfound popularity is the growth in the use of the Web and multimedia technologies used on the Web. As Figure A-6 shows, the percentage of households using the Internet doubled in the three years after 1997.

- Among the most significant technological developments that contributed to the growth of multimedia were programs that allow audio and video to be delivered over the Web. RealPlayer is one of the most popular of these programs.

- A dramatic decrease in price also contributed to the widespread distribution of multimedia CD-ROM titles. In 1992, the average price of a CD-ROM title was $100; today, it is less than $20.

- Marketing by computer companies was another reason for the growth in multimedia applications. The industry saw multimedia as the next “killer application.” Why? Because companies knew consumers would spend billions of dollars on hardware components such as CD/DVD drives, audio cards, video cards, speakers, and software programs such as those for authoring, animation, and video and sound editing. To meet consumer demand, companies geared up to manufacture the components and software. Trade associations were formed to develop standards to help advance the industry, and book and magazines were published to educate and entertain consumers. Graphic artists, instructional designers, video producers, programmers, and musicians began to learn the new technology that would dramatically affect their professions.

- Adding value to an existing product is another reason for the growth of multimedia. Computer systems already existed and consumers were using them. Adding multimedia capability to basic computer systems then made multimedia accessible to all computer users. Consumers embraced multimedia and ensured its rapid growth; they quickly discovered that multimedia allows the user to control the content, to individualize the content, and to participate actively in the content.
When multimedia was first emerging in the 1980s, millions of desktop computers were already found in businesses, homes, and schools. As the technology improved to allow animation, sound, and video to be played on a desktop computer, dozens of companies became interested in developing multimedia titles. They faced a dilemma, however: so many different types of computer systems varying in speed, capacity, and display capabilities existed that they ran the risk of creating a title that would work on only a limited number of computers. The lack of standardization represented a barrier to entry into the industry for many developers. A second barrier was the lack of a way to deliver the large amount of data required for a multimedia title through the desktop computer. These barriers were overcome through the development of industry standards and the widespread use of CDs.

Source: U.S. Department of Commerce
Examining educational applications

Various ways exist to classify multimedia titles. They can be classified by market (such as home, business, government, and school), or by user (such as child, adult, teacher, and student), or by other categories (such as education, entertainment, and reference). Many titles can be placed into more than one group. This lesson focuses on the use of multimedia in educational applications.

**Details**

- A goal of the educator is to facilitate learning so as to help the student gain a body of knowledge, acquire specific skills, and function successfully in society. A major challenge to any educator is the diversity of ways in which students learn. Some people learn better through association, others by experimentation; some respond to visual stimulation, others to sound. Multimedia can accommodate a variety of learning styles.

- Often, students process new information in a nonlinear fashion. As they are reading in a textbook, they may come across a term that causes them to jump to another part of the book (for example, a glossary) before continuing. Multimedia, with its hyperlinking capabilities, can present the content in a way that allows the learner to jump from idea to idea in just such a nonlinear way.

- Because multimedia applications are user-controlled, students can proceed at their own pace and focus on those areas that are most interesting or helpful to them. For example, a student could watch an animation of the splitting of an atom over and over if necessary.

- Multimedia can be extremely motivating by allowing the user to take charge of his or her learning experience. In addition, it can provide immediate feedback, adjust the level of difficulty, and evaluate skills. For example, Pat, a student at Cascadia College, works in the computer lab on DNA replication for Biology 101. When she starts, the program asks whether she would like to take a pretest, review the process, or begin the tutorial. She selects the tutorial, then watches as a 3-D image of a double helix rotates on the screen. At any time, Pat can stop the process, review previous steps, ask for help, take a test, or quit the tutorial.

- Online courses and online enhancements to traditional courses, as shown in Figure A-7, are a rapidly growing part of higher education. Multimedia facilitates the user's desire for knowledge by providing pertinent information on demand, which creates a perpetual virtual-reality learning environment. Benefits of online courses include allowing students to access course material at any time and from virtually any location. In addition, audio lectures with accompanying PowerPoint slide presentations can be played; animations of complex processes such as DNA replication can be viewed, slowed down or speeded up, and replayed; and virtual labs allowing students to conduct experiments can be accessed.

- With the use of multimedia, students can easily access pertinent information in shorter timeframes. They can use multimedia to validate their results and obtain immediate feedback. As a consequence, students can spend more time focusing on pertinent information and less time wading through slower, manual-oriented processes. Figure A-8 depicts an award-winning educational title called A.D.A.M. that uses multimedia to teach human anatomy.

- *Edutainment*, as the name suggests, is the combination of education and entertainment. Many multimedia titles, especially children's games such as Sim City, fall into this category. Children like these titles because they are fun; parents like them because they have some educational value.
Multimedia enhances reference titles

Encyclopedias, census data, Yellow Pages directories, and dictionaries are examples of online and CD multimedia reference titles. In many cases, they represent "electronic" versions of existing reference books. The challenge to the developer is to make it easy for the user to find the desired information as well as to effectively use other multimedia elements such as sound, video, and animation. For instance, Microsoft Encarta includes more than 42,000 articles, 3000 audio clips, and 23,000 photos and illustrations. It also includes a timeline that helps you see how civilizations and events are related. When a subject interests you, you can simply click on it to access more information. Encarta also offers a browse function that you can use to skim through thousands of topics.
Examining entertainment applications

Game developers were pioneers in the use of multimedia. From large-style arcade video games to hand-held Nintendo Game Boys, the focus in this area has been on action and graphics. The developer of multimedia games needs to attract, engage, captivate, and challenge the user. Such developers have shifted the emphasis from pure action to action plus story-telling; from games to entertainment; and from the physical (hand-eye coordination) to the mental (solving the mystery, overcoming evil, outwitting the opponent). Multimedia incorporates all of the elements—fast action, vivid colors, 3-D animations, and elaborate sound effects—that are essential to entertainment. It can also be used to provide rewards, recognition, and a sense of accomplishment—components that are popular features in entertainment titles. For example, when a player wins a game, triumphant sounds might be played, the user’s name might be flashed on the screen, and the score might be scrolled across the screen.

Details

► Although CD-ROM-based games have been available for several years, online games (including multiplayer environments) are relatively new. Today, Web sites can be found that cater to almost any type of gaming interest. Myst, shown in Figure A-9, is an interactive adventure in which you search for clues to unravel the secrets of an island world. It includes high-resolution graphics, animations, and sound effects.

► One of the most interesting new fields in entertainment involves virtual worlds. Active Worlds, shown in Figure A-10, is a Web site that provides a variety of 3-D environments. Individuals can log on to the site and interact with other users in a virtual environment that includes chat sessions with others who have similar interests.

► Online entertainment titles can be classified into different categories. Sports sites include Beckett Interactive Football League. Mystery sites include Avalon, a mythological world in which you can develop your own characters and interact with other real-life and imaginary beings in real-time. Adventure sites include Webstrike, a real-time tactical war game. Fun sites include Playsites’ backgammon, checkers, and chess.

► Recreation applications, another subset of entertainment applications, are similar to games but have a slightly different focus. They often give the user a vicarious experience such as being able to “play” the most famous golf courses in the world or “fly” over 3-D cityscapes. Hobbies and sports are examples of the types of titles that could be classified as recreation applications.

► One of the most popular and oldest multimedia games is the award-winning Microsoft Flight Simulator. This virtual environment is so realistic that the U.S. Navy has used it to train pilots. Flight Simulator has become so widely used that an entire community surrounds the product, including Web sites, user groups, newsletters, and add-on products from third-party vendors, such as one that lets the user retrace Amelia Earhart’s final voyage. Because of its realistic simulations, the most recent release of this product requires a more powerful computer setup than most games, including a Pentium 166 processor, 3-D graphics accelerator card, 500 MB of hard disk space, 64 MB of RAM, and a joystick or flight yoke game controller.

► Multimedia applications and titles do not fall neatly into categories. The dividing lines among categories are vague, which means that a multimedia title could be classified in more than one category. Table A-1 lists several titles and shows how they might be classified.
You are about to be drawn into an amazing alternative reality designed to draw you in with little or no extraneous distractions. Vital clues to your unraveling a chilling tale of intrigue and injustice that defines all boundaries of time and space. Only your because those are the pieces of the puzzle that you’ll use to uncover the secrets of Myst. The puzzles you encounter will be solved.

Table A-1: Examples of how CD titles can fit into more than one category

<table>
<thead>
<tr>
<th>Multimedia Title</th>
<th>Entertainment</th>
<th>Education</th>
<th>Reference</th>
<th>Recreation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myst (animated adventure)</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encarta (encyclopedia)</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bookshelf (reference title)</td>
<td></td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Just Grandma and Me (children’s story)</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microsoft Golf (game)</td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>A.D.A.M. (anatomy instruction)</td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>From Alice to Ocean (trek across Australia)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Examining business applications

Businesses and organizations have embraced the use of multimedia in marketing, training, and presentations. All of these areas share one thing—the need to communicate. For the marketer, the goal is to inform and to persuade the potential buyer as a way to sell a product, service, or idea. For the corporate trainer, the goal is to maintain a well-informed and productive work force. For the presenter, the goal is to inform and perhaps to motivate the audience. Using multimedia can help businesses and organizations achieve these goals.

DETAILS

- The Internet is the business world's dream come true. It provides an opportunity for every company to “go international” and to distribute its products and services directly to the end user at a reasonable price. Home pages on the Web provide interactive, online shopping through the Internet, as shown in Figure A-11. Often .com (pronounced dot-com) companies allow you to browse through a catalog and select merchandise to view. They might even provide video clips or 3-D animations to demonstrate their product line. Buyers can customize the product (change the color, add accessories, and so on) and then place orders.

- Certain magazines are now published and distributed online rather than in print. These online magazines can come alive with multimedia elements such as sound and video as well as links to related articles, products, and services.

- Corporate training is a multibillion-dollar industry. Training titles focus on developing specific skills usually related to a particular job. For example, the Boeing Company has an entire Training Division dedicated to developing multimedia applications, including computer simulations. Some of its multimedia applications are used to teach mechanics how to troubleshoot and repair equipment; others are used to instruct pilots on new aircraft systems. Employees of Holiday Inn are trained using a computer-based, interactive role-playing game, which is designed to help the employees improve customer service. Several online companies, including Click2Learn, have created Web sites to address corporate training needs by providing multimedia-based courses that prepare employees to take certification tests, such as the Microsoft Certified System Engineer exams.

- Thousands of business presentations are made each day. Company CEOs give annual reports at stockholder meetings. Sales representatives “pitch” their product line to potential customers. A conference keynote speaker tells an audience about industry trends. Multimedia can enhance presentations—sometimes, through the use of an “electronic” slide show (see Figure A-12) or an interactive video display. Multimedia gives the presenter a powerful tool with which to attract and focus the audience's attention, reinforce key concepts, and enliven the presentation.

- Another form of corporate communication involves training employees using multimedia-enhanced materials. Corporations now routinely provide new employee orientation via their intranets. An intranet is an internal computer network set up to facilitate communications among employees, customers, vendors, and selected others. Here new employees can access company history, goals, product information, and corporate policies. These interactive Web sites often include video segments, such as a welcome message from the company CEO.
Multimedia presentation developed on laptop computer, which is connected to a projector; presentation display matches display on monitor.

Shopping cart used to indicate what you have selected to purchase.

Button used to access information about your account.

Text box used to search for a product.
Understanding multimedia computer playback systems

When studying computer systems with multimedia capabilities, it is useful to draw a distinction between those systems used for development and those used for playback. Development systems need to be the fastest and most powerful, and they should have the largest storage capacity that a company or individual can afford. The development process is people-intensive—and people’s time costs money. The better tools developers have, the more quickly they can work. On the other hand, the type of computer system used for playback is related to the installed market—that is, the computers in use. This lesson looks at the components of a multimedia computer playback system.

**DETAILS**

- Every computer has a **processor**, which is the component that controls the operations of the computer system and performs calculations. The type of processor determines, among other things, how quickly data is processed and transferred. This issue becomes critical as the multimedia title becomes more graphic-, sound-, animation-, and/or video-intensive.

- The package containing a multimedia title will specify a minimum configuration. The lower the configuration, the larger the potential market. Often, the package will also specify a recommended configuration that will provide better-quality video, sound, and graphics as well as smoother animations.

- A computer has two basic types of memory: temporary (called **random-access memory**, or RAM) and permanent. Temporary memory stores instructions and data that are used while an application is running. For example, if you are playing a game on the computer, some of the game instructions are loaded into the temporary memory as the game is played. This approach helps to speed up the actions within the game and, in turn, makes the game more enjoyable for the player(s). When you quit the game, 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. When you install a program, a set of instructions is copied from the CD to the computer’s hard drive. These instructions allow you to run the program without having to repeat the installation process. Then, the next time you want to play the game, you simply insert the CD and select the program’s icon from the screen. While the program is running, instructions and data are loaded from the hard drive and CD as needed. Although the term “permanent” is used to describe the memory on the hard drive, you can, of course, erase programs from a hard drive.

- The monitor is critical to the playback system because it provides the primary communication with the user. Standards have been established regarding screen resolution and number of colors. Screen resolution is measured in terms of the number of dots, called **pixels** (picture elements), displayed on the monitor. Pixels are the smallest units that a monitor can display. Figure A-13 shows how the letter P is made up of several pixels in a grid pattern. The more pixels, the sharper the screen image.

- An earlier standard resolution was 640 pixels across and 480 down the screen. Figure A-14 shows the same image using two different screen resolutions, 640 × 480 and 1024 × 768; the latter resolution is now considered the standard. Notice the better quality of the image displayed in 1024 × 768 resolution.

- To display graphics, a computer must have a video graphics card. The video graphics adapter card and its memory capacity determine the number of pixels presented on screen. For Windows-based computers, VGA (Video Graphics Array) cards support a resolution of 640 × 480; SVGA (Super VGA) cards can support much higher screen resolutions. The video card also determines the number of colors that can be displayed on the screen, and hence the color quality. The more colors, the higher the image quality. Each pixel can display from one color to millions of colors.

- Whether used in games to provide “sound effects” or in education titles to teach foreign languages, sound is an important element in a multimedia title. 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 is used to play digital sounds. The quality of the digital sounds is determined by the binary digits (bits) used to represent the sound. A **binary digit** is the smallest unit used to represent the coding of data in a computer. The standard is now 16-bit sound.
CD-ROM and DVDs

CD-ROM (Compact Disc Read-Only Memory) and DVD (Digital Versatile or Video Disk) drives read data (graphics, sound, text, and so on) on a CD/DVD and transfer it to the computer. The drive determines the type of CD/DVD that can be played, the speed at which data can be located on the CD/DVD, and the speed at which data can be transferred from the disk to the computer. The data transfer rate is measured in kilobytes per second. A kilobyte (KB) is roughly equivalent to 1000 characters of data. The seek time—the time required to find a specific piece of data on the CD/DVD—is measured in milliseconds (ms); thousands of a second.
Understanding multimedia computer development systems

Developers realize that to produce commercial-quality titles that will keep up with the competition in terms of high-end graphics, sound, and video, they must invest in the best-quality equipment they can afford. Not only does high-end equipment provide the necessary development quality, but it also holds down production costs by reducing the time programmers, graphic artists, animators, and others spend in creating their part of the title. Figure A-15 shows a typical multimedia computer development system.

**Details**

- Both Windows-based and Macintosh computers are used to create multimedia titles. Because the Macintosh was the first popular personal computer to provide a graphical interface and because it has superior handling of graphics and cross-platform capabilities, it has been used extensively in multimedia development. Software is available that allows a developer to choose either platform (Windows-based or Macintosh) for creating a multimedia title and for having the title play back on both platforms.

- Today, a Pentium III 500 processor is considered the minimum needed for development work. A Pentium III 750 or better is desirable. A Power Mac processor running at 500 MHz is the minimum Macintosh configuration.

- Multimedia titles are extremely memory-intensive. Consequently, 128 MB of RAM is considered the minimum needed, with 256 MB being more desirable. Hard drive disk space is a function of the number of programs that need to be stored on the drive. It is common to use several programs in multimedia development, including drawing, authoring and image, sound, and video editing software. All of these programs take up disk space. Add to this the space required for the various elements of the title, and you can quickly run out of room. Minimum hard disk space is 20 GB (20 billion bytes).

- When video will be used, it must be digitized using a video capture card. The card fits internally within the computer, and a video source (camera, VCR, TV) is then plugged into the card. As the video signal is sent from the source, it is captured, digitized, and stored. Later, it can be edited by deleting frames, adding text, adding sound, and so forth.

- While playback units typically have 15” or smaller monitors, developers need larger (19”) models. This size monitor 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.

- In addition to the basic computer system, several other hardware devices may be needed when developing a multimedia title.
  - Scanners are used to create digitized images so that the images can be incorporated into multimedia titles.
  - **External storage devices**, like the one shown in Figure A-16, provide additional storage space to relieve the pressure on a computer’s hard drive.
  - A **digital camera**, as shown in Figure A-17, is used to capture still images just like a regular camera.
  - A microphone can be used to add narration, voice-over, or sound effects to the title.
  - Depending on the elements to be incorporated into the multimedia title, other hardware components might include a digital video camera or VCR.
FIGURE A-15: A typical multimedia computer development system

FIGURE A-16: An external storage device

FIGURE A-17: A digital camera
Issue: What is the appropriate use of multimedia?

Despite multimedia’s many advantages, is it always appropriate to use multimedia? While the allure of multimedia is substantial, developers must weigh the development time and the costs of alternatives. All of the advantages associated with multimedia cannot compensate for a lack of content, poor design, targeting of the wrong audience, or delivery by a mediocre presenter.

Reading large amounts of text on a computer screen is tedious and tiring, both physically and mentally. Placing a book on a CD with some multimedia elements such as sound and expecting the user to read it “from cover to cover” is not a good use of multimedia. Developing interactive books in which the user becomes an active participant and can make choices that influence the storyline and outcome, however, can be effective. Similarly, multimedia reference titles can contain a great deal of text. But, by allowing the user control over the content and by adding other elements (such as animation, sound, and video), multimedia developers can overcome the drawbacks of text-intensive pages.

Is video an appropriate use of multimedia? First, simply watching a movie or any digitized video from beginning to end is not multimedia. In fact, using video inappropriately can be damaging rather than advantageous. Consider one company that wanted to showcase its high-tech image by sending out invitations to an upcoming conference on CDs. The content of the CD consisted of a well-developed video about the company, which included interviews, product demos, future plans, financial data, and so forth. Using a video for promotional purposes may have seemed like a good idea, but the result was a ten-minute video that played in a small window on a computer screen with poor resolution and no user control.

Before developing and distributing this title, the company should have asked the following questions: How many potential conference attendees will have multimedia computer playback systems? Will the user want to watch ten minutes of video on a computer screen? Will the user be impressed with the company's attempt at creating a “high-tech” image? A better approach would have been to design the CD content to play well on low-end user playback systems and to allow the user to choose from a menu what content to view. The menu might have included links to company background information, interviews, product demonstrations, and other options. After selecting a menu option, the user would see a short video clip associated with the menu choice. This approach would have permitted the user some control over the content of the video.

As a multimedia developer, you must always be up on the most recent “bells and whistles.” But before incorporating them into a title, you must also ask: Should I use these multimedia elements? Are these elements appropriate in this title? Do these elements help us meet the title objectives?

EXPAND THE IDEAS

1. Write a one-page paper that presents your answer to the Issue question. Discuss the advantages and disadvantages of using multimedia. Provide a concrete example of multimedia used appropriately and another example of multimedia used inappropriately.

2. Work in small groups to develop guidelines for creating a multimedia presentation for class. Consider questions such as the following: Who is your audience? What is the topic of the presentation, and is it appropriate to use multimedia with it? What hardware and software considerations must be made? Discuss why these guidelines are important in helping to determine whether it is appropriate to use multimedia in a given situation.
Issue: The Multimedia Personal Computer (MPC) Standards: Are they needed?

As the personal computer (PC) industry was growing during the 1980s it became apparent that hardware standards were needed. The installed market, however, often thwarted the efforts of companies developing applications, including multimedia titles, for personal computers. These companies could not produce a different version of their application for every possible PC configuration (processor speed, memory capacity, monitor resolution). It is interesting to note that this development issue (for example, what computer configuration to develop for) was not as critical a concern for companies developing titles for the Apple computers. This is because the Apple Corporation controlled the specifications of each of its models and those developing applications that ran on Apple computers knew exactly what hardware components were included and could develop specifically to those components. Many companies, however, were manufacturing Windows-based computers with several different configurations. This created a definite development problem for companies creating titles for PCs.

In 1990 a group of companies agreed on the Multimedia Personal Computer (MPC) specifications for Windows-based machines. These specifications became known as the MPC Level 1 specifications. The MPC Level 1 specifications focused on the speed and capacity of the system unit, the resolution and colors for the display unit (monitor), and the quality of the CD-ROM drive and sound card. An MPC logo was developed and those companies that manufactured hardware that met the specifications or those companies that developed applications that ran on the MPC machines were allowed to use the logo. The logo was a great advantage to consumers, who could use the logo to tell at a glance if an application was compatible with their hardware.

In 1991 the Multimedia PC Marketing Council was formed to promote and revise the standards. This council was affiliated with the Software Publishers Association, the predominant industry trade group. The council included Microsoft, IBM, Philips Consumer Electronics, Comptons New Media, and NEC Technologies. Those developing the standards were faced with a trade-off: size of the market versus power of the computer system. If the standards were set high, developers could create more exciting and compelling titles — increasing the market appeal. On the other hand, the installed market consisted of computers at the low end of computing power. Understandably, consumers were hesitant to purchase entirely new systems to run applications. The challenge was to create standards that would allow companies to develop to the widest possible audience and still take advantage of newer computing technologies.

In 1993, the MPC Level 2 specifications were published. The MPC Level 2 specifications had a dramatic effect on the industry. The MPC Level 2 specifications reduced the risks involved in developers creating titles. As a developer, you knew that if you created a CD title that met the MPC specifications, the title would run on MPC machines. In addition, when you put the MPC logo on your product, consumers knew that your title would run on their MPC machines.

In 1995, the Software Publishers Group took responsibility for upgrading the MPC standards and released the MPC Level 3 specifications. MPC Level 3 specifications included a requirement for video compression that allows full screen and full motion video. What has happened since 1995? What role do the MPC standards play in the development of multimedia titles today?
End of Unit Exercises

STUDY TIPS

1. Based on the information presented in this unit, write your own definition of multimedia. Cite examples of multimedia and explain why they meet your definition.

2. Review the key terms in this unit. Over the next week, look for them in daily conversation and print. Are these words becoming more commonly used? In which situations do you encounter them?

3. Think about a concept you have studied in another class. How might a multimedia activity be used to help someone learn the concept? Be sure to include multimedia elements covered in this unit in your answer to this question.

4. Discuss this class with three friends who are not class members. Ask them to define multimedia and to give you examples of it. Compare what you have learned to their concept of multimedia. Do you feel that you can adequately explain what multimedia is to someone else? Why or why not?

5. List and explain the three most important concepts you have learned from this unit. Compare your list with that of another student in the class. Do you have any concepts in common? Would you include any of the other student’s concepts in your list? Why or why not?

6. Do you think multimedia has more of an effect on education, business, or entertainment? Use examples to support your choice.
INDEPENDENT CHALLENGE 1

Multimedia is an important part of a business environment—both in an office and on the Internet. The office environment applications are often used for training purposes. But why and how is multimedia used in business on the Web?

To complete this independent challenge:

Evaluate three Web sites that use multimedia for business. Develop a report that compares the sites. Include the following information in your report:

1. The name of the company, the type of business, and the URL for each site.
2. An example of how each site uses multimedia to enhance its site.
INDEPENDENT CHALLENGE 2

The use of multimedia in education is valuable because students have different learning styles that can be addressed by delivering content in different ways. For example, sound and animation can enhance text material. Also, when the content is available on the Web, students may have the opportunity to access it at any time and from anywhere.

To complete this independent challenge:

1. Connect to the Internet.
2. Go to http://www.course.com, navigate to the Student Online Companion for this book, then click the link for Unit A.
3. The Unit A link contains links to Web sites providing information about learning styles. Click each link to visit the site and read about learning styles and how multimedia can be used to address various learner needs. Write a brief summary of each site — highlighting key points about learning styles and the use of multimedia.
4. After completing your research on learning styles and multimedia, evaluate three Web sites that use multimedia for education. Develop a report that compares the sites. Include the following information in your report:
   a. The URL for each site and its target audience.
   b. An example of how each site uses multimedia to enhance its site and address specific learning styles.
   c. An example of how multimedia could be used to address other learning styles.
   d. An example of how multimedia is used poorly on one of the sites; explain why it is a poor use.
   e. The best site in terms of use of multimedia to address learning styles; explain why it is so good.

INDEPENDENT CHALLENGE 3

Multimedia is constantly in the news as more and more applications, especially those intended for the Web, are developed.

To complete this independent challenge:

1. Submit a two-page (typed, double-spaced) review of a magazine or newspaper article related to multimedia. If you have access to the Internet, you might find an article using your favorite search engine. Include the following information in your review:
   a. Name and date of publication.
   b. Name of article.
   c. Review of article (in your own words).
   d. Conclusion: Do you agree with the author's point of view? Why or why not?
2. Be prepared to share your report orally.
3. An example of how multimedia could be used to further enhance at least one of the sites.
4. An example of how multimedia is used poorly on one of the sites; explain why it is a poor use.
5. The best site in terms of use of multimedia; explain why it is so good.

INDEPENDENT CHALLENGE 4

CD-ROMs are a major source of multimedia titles. A search of the Internet or a trip to a computer store will show you just how popular CD titles have become.

To complete this independent challenge:

Choose a CD multimedia title to review (if possible, in a lab or one you have at home or work). Develop a report that includes the following information:

1. Product title and publisher information
2. Purpose of the product
3. Intended audience
4. Equipment required
5. Elements of multimedia used (sound, animation, and so on)
6. Design of the title screen
7. Information contained on the title screen
8. Method of navigation through the program
9. Approximate time needed to navigate the entire product
10. Way in which the product is divided if there is not time for the user to complete all of it
11. Strengths of the product
12. Weaknesses of the product
13. Ways you change the product to make it better
14. Cost of the product
Multimedia can be classified into a variety of categories. This unit provided a discussion as well as examples of some of these categories. How would you define the various multimedia categories? Which multimedia titles would you assign to which categories?

To complete this independent challenge:

1. Create a table similar to the one shown previously in Table A-1.
2. Define each category.
3. Review six to ten multimedia titles.
4. Based on your review, state how you would classify the title. Write a brief comment explaining why you would use that classification. (Note: Some titles might be assigned to more than one category. Provide support for each classification that you assign to the title.)

An understanding of basic computer system configurations is useful in determining the appropriateness of a system for working with multimedia applications.

To complete this independent challenge:

1. Complete Table A-2 for each computer system that you use.
2. Leave blank those areas that do not apply.
3. Write a summary report based on the information in your computer table.

<table>
<thead>
<tr>
<th>Make and model</th>
<th>HOME COMPUTER</th>
<th>WORK COMPUTER</th>
<th>SCHOOL COMPUTER</th>
<th>OTHER (SPECIFY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating system, including version number</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAM (in MB)</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Processor (type and speed)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Hard drive (in MB)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD-ROM drive (access speed in ms and transfer speed in KB)</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Sound card (8-bit or 16-bit)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Video display (resolution and number of colors)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
VISUAL WORKSHOP

Use Figure A-18 to answer the following questions:

1. Which multimedia elements can you identify in the figure?

2. What opportunities exist for user interactivity? Describe them.

3. Write a step-by-step account of how you would progress from the search page to the audio clip associated with the didgeridoo.

FIGURE A-18