Chapter 10: Multimedia and the Web
Learning Objectives

• Define Web-based multimedia and list some advantages and disadvantages of using multimedia.
• Describe each of the following multimedia elements—text, images, animation, audio, and video—and tell how they differ.
• Briefly describe the basic steps and principles involved with multimedia Web site design.
• List the various tasks involved with multimedia Web site development.
• Explain how markup languages, scripting languages, and other tools are used today to create multimedia Web pages.
• Discuss the possible format of Web-based multimedia in the future.
Overview

• This chapter covers:
  – Types of Web-based multimedia applications and advantages and disadvantages of using multimedia
  – A look at basic multimedia elements
  – Steps and principles in designing multimedia sites
  – How a multimedia Web site is developed and tested
  – A look at the future of Web-based multimedia
What Is Web-Based Multimedia?

• Web-based multimedia (also called rich media): Web sites containing more than one type of media—typically sound, video, or animation, in addition to text and images

• Multimedia sites often contain elements that users interact with directly
  – Control the delivery of a sound or video clip, manipulate a 3D object, play a game, etc.

• Fast computers and broadband Internet connections make Web-based multimedia much more feasible than in the past
Web-Based Multimedia Applications

- Information delivery: Photos of products, video clips, animation to convey concepts, etc.
- E-commerce: Photos of products, samples of movies and music, etc.
  - Can use virtual reality (VR) to convey three-dimensional views of products, homes for sale, etc.
- Entertainment: Online games, video clips, online music, interactive activities, etc.
- Web-based training (WBT): Delivering instruction via the Web
Web-Based Multimedia Applications

**INFORMATION DELIVERY**
Multimedia elements can be used to convey information about a company and its products.

**E-COMMERCE**
Multimedia elements can be used for e-commerce purposes, such as this virtual model home tour located on a home builder’s Web site.

**ENTERTAINMENT**
Multimedia elements, such as background music, images, animation, and more, are often included in online games.

**WEB-BASED TRAINING (WBT)**
Multimedia elements, such as video clips and animations; online exercises, tutorials, and exams; e-mail links; and other resources, are often included on WBT sites.

**FIGURE 10-1**
Web-based multimedia applications.
Advantages and Disadvantages of Using Web-Based Multimedia

• Advantages:
  – Can address a variety of learning styles
    • Visual learners
    • Auditory learners
    • Kinesthetic learners
  – Material more interesting and enjoyable
  – Many ideas are easier to convey

• Disadvantages:
  – Time and cost of development
  – Compatibility and download time for Web-based multimedia
Advantages of Using Web-Based Multimedia

FIGURE 10-2
Multimedia-based applications are often more interesting and more effective than their single-medium counterparts.

SUPER SAFARI BINOCULARS

Step 1
Cover one end of each tube with cellophane. Tape cellophane to tube.

YOU’LL NEED:
Two 4 1/2-inch cardboard tubes (toilet paper tubes)
Colored cellophane, cut into 3-inch circles
Tape
Construction paper, cut into two 4 1/2 x 6-inch pieces
Pencil
Two 24-inch pieces of yarn

STEP 1
Cover one end of each tube with cellophane. And then tape cellophane to tube.

STEP 2
Cover each tube with a piece of construction paper. Tape paper to tubes.
Place tubes side by side. Tape tubes together.
With a pencil, poke a hole in outside edges of tubes about 1/2 inch from ends.
Use pencil to poke one end of yarn through each hole. Tie each end to prevent it from slipping out.

STEP 3
Finally, wrap the remaining yarn around other ends of tubes to cover tape and then tie it.

There’s a super safari binoculars!
Multimedia Elements

• Text: Used to supply basic content, as well as to add text-based menus and hyperlinks
  – Serif typefaces: more readable, used for large bodies of text
  – Sans serif typefaces: used for titles, headings, Web page banners
  – Different typefaces can convey widely different feelings and impressions
  – Important to select the appropriate font size
  – When a consistent text appearance is required—such as a logo—a graphical image is used instead
Multimedia Elements

- Images or graphics: Digital representations of photographs, drawings, charts, and other visual images
  - Clip art consists of predrawn electronic image
  - Stock photos are also available online
Multimedia Elements

- Images are available in many forms
  - GIF: A graphics format commonly used for Web page line art images
    - Supports 256 colors, though can use a smaller color palette as needed
    - Can be transparent
    - Can be interlaced
    - Uses lossless file compression
    - Several GIF images can be combined to form animated GIFs
### Multimedia Elements

#### NONTRANSPARENT VS. TRANSPARENT GIFS

- **Nontransparent** (image’s white background is visible on top of the page’s yellow background).  
  ![Nontransparent GIF](image1)

- **Transparent with white specified as the transparent color** (page’s yellow background is visible through the transparent areas of the image, so the image appears to be nonrectangular).  
  ![Transparent GIF](image2)

#### NONINTERLACED VS. INTERLACED GIFS

- **Noninterlaced GIF** (image is displayed top to bottom).  
  ![Noninterlaced GIF](image3)

- **Interlaced GIF** (the complete image is displayed initially, but the quality is progressively increased).  
  ![Interlaced GIF](image4)

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*Figure 10-5*  
Transparent and interlaced GIFs.
Multimedia Elements

– PNG format was designed specifically for use with Web page images
  • Lossless compression, and with more efficiency than GIF
  • Can use color palette or true color
  • Cannot be animated

– JPEG format supports true color and is commonly used for photographs inserted in Web pages
  • Can be progressive
  • Uses lossy file compression
  • The amount of compression is specified when the file is saved
FIGURE 10-6
The amount of compression in a JPEG file affects both the file size and the display quality.

<table>
<thead>
<tr>
<th>Compression Level</th>
<th>Image Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No compression</td>
<td>(37 KB)</td>
</tr>
<tr>
<td>40% compression</td>
<td>(13 KB)</td>
</tr>
<tr>
<td>80% compression</td>
<td>(7 KB)</td>
</tr>
<tr>
<td>100% compression</td>
<td>(3 KB)</td>
</tr>
</tbody>
</table>
Multimedia Elements

– Choosing a graphic format

• GIF—typically used for line art (clip art, logos, navigation buttons, etc.)
• PNG—alternative format
• JPEG—typically used for photographs
• Select the most appropriate format
• For JPEG, balance compression quality and file size
LINE ART
The GIF or PNG format is usually used for line art images.

PHOTOGRAPHS
The JPEG format is usually used for photographs.

FIGURE 10-7
Graphic formats. It is important to select the most appropriate format for each image.
Multimedia Elements

- Thumbnail image: Small image on a Web page that is linked to a larger, higher-resolution image
  - Used to save loading time since only users who click the thumbnail view the full-quality image
Multimedia Elements

• Animation: A series of graphical images are displayed in succession to simulate movement
  – Java applet: A small program inserted into a Web page that performs a specific task
  – Animated GIF: A group of GIF images saved as an animated GIF file, inserted in a Web page, which are displayed successively to simulate movement

FIGURE 10-9
An animated GIF. When the images shown above are displayed one after the other, it appears that the leopard is running.
Multimedia Elements

- For more complex animations, developers can use JavaScript or another scripting language
  - Flash is in particularly wide use today
  - Silverlight is an alternative to Flash
  - Flash Lite: Used for mobile application development
- Multimedia authoring software can be used to create multimedia elements
- Many Web-based animations require a plug-in
Multimedia Elements

**FIGURE 10-10**

JavaScript and Flash are commonly used on Web pages.

**JAVASCRIPT**

JavaScript is used in conjunction with Flash to animate the characters, light up the menu buttons as they are pointed to, and randomly change the images displayed in the two TV screens.

**FLASH**

Many games and other animated or interactive activities found on Web sites use either Flash or Shockwave. A plug-in is required to view the content.
Multimedia Elements

- Audio: All types of sound including music, spoken voice, sound effects
  - Can be recorded using a microphone or MIDI instrument, captured from CDs, or downloaded from the Internet
  - Often played when an event occurs on a Web page or when the visitor clicks a link
  - Streaming audio is used to speed up delivery
  - Common audio file formats include
    - .wav
    - .mp3
    - .midi
    - .aiff
    - .acc
    - .m4a
Multimedia Elements

- Video: Begins as a continuous stream of visual information, which is then broken into separate images (frames) when the video is recorded
  - Can require a substantial amount of storage space
  - Video data, like audio data, is usually compressed
  - Streaming video is used for large files
  - Common video file formats include:
    - .avi
    - .mp2
    - .mp4
    - .mov
    - .rm
    - .wmv
Multimedia Web Site Design

- Web site design: Refers to planning what a Web site will look like and how it will work
  - Good planning pays off in the long run
- Basic design principles:
  - Users like interesting and exciting applications
  - Users have little patience with slow-to-load or hard-to-use applications
  - Plan for all needed delivery methods and devices
Multimedia Web Site Design

• Careful consideration should be given to:
  – Features that require a specific browser
  – Features that require little used plug-ins
  – The size of the page content
    • Different devices, browser, and screen resolutions affects how Web pages display
  – High-bandwidth items
    • Watch image file size
    • Use links to audio, video, and other high-bandwidth items
    • Use streaming audio and video
Multimedia Web Site Design

- Determining the intended audience and objectives
  - One of the first steps in designing a multimedia application or Web site
  - Objectives of the site affect its content
  - Intended audience affects the appearance (such as the style, graphics, fonts, and colors) of the site
  - Once the objectives and audience have been identified, you should have a good idea of the main topics to be included in the site
  - If the needed content is still unclear, rethink your audience and objectives and don’t go further in the process until it becomes clear
Multimedia Web Site Design

**Figure 10-12**
The intended audience affects the design of a Web site. Shown here are four types of sites that are designed for different audiences.

**BOLD**
Shopping sites often use bold colors and crisp typefaces to give the site a contemporary, but rich, feel.

**CONSERVATIVE**
Many business sites use a conservative appearance to match their conservative image.

**WHIMSICAL**
Sites catering to young people often have an especially friendly look, sporting bright graphics and large fanciful typefaces.

**BUSY**
Sites designed for more technically-savvy users often have a busy appearance with lots of links so that visitors can go directly to the information they are seeking. This style is commonly used with portal pages, as well.
Multimedia Web Site Design

- Flowcharts, page layouts, and storyboards are used to design the structure and layout of a site
  - Flowcharts: Show how the pages in a Web site relate to one another
  - Page layouts: Show the basic layout of the pages on a Web site
    - Typically one for the home page and one for the rest of the pages on the site
  - Storyboards: Illustrate the content of an animated sequence or other multimedia component
FLOWCHARTS
A Web site flowchart describes the logical organization of the site. Each box represents a separate Web page.

PAGE LAYOUTS
Page layouts illustrate the basic design and navigational structure of a Web site. There are typically two basic layouts—one for the home page (shown here) and one for all other pages on the site.

FIGURE 10-13 Web site flowcharts and page layouts. A sample flowchart and page layout for a bed and breakfast Web site are shown here.
Multimedia Web Site Design

- Navigational design considerations
  - Users should be able to get to most pages on the site within three mouse clicks
  - Navigational items should be placed in the same location on every page
  - Each page should have a link to the home page of the site
  - Long Web pages:
    - Consider breaking into several pages
    - Include link to view or print entire document
    - Use table of contents and links to top of page
Multimedia Web Site Design

- Navigational tools include:
  - Drop-down menus
  - Site maps
  - Search boxes
  - Text-based hyperlinks and navigation bars
  - Image-based navigation bars
  - Image maps
  - Frames
  - Hyperlinks that show more options when pointed to
Multimedia Web Site Design

FIGURE 10-14
Navigational tools.
A wide variety of navigational tools exists to help make Web sites easy to use.

HOME PAGE LINK
Gives users a quick link to the site’s home page from any page on the site; link is often a company logo.

NAVIGATION BAR
A group of text- or image-based links; should be in the same location on every page of the site.

SEARCH BOX
Allows users to find pages on the site containing specific information.

MENU TABS
Provide access to the main pages of a site, as well as indicate the currently displayed page.

SITE MAP
A Web page that contains links to all of the main pages on a site.

IMAGE MAP
A single image that has multiple clickable areas; each designated area is linked to a specific page on the site.
Multimedia Web Site Design

• Access considerations:
  – Device compatibility: Web pages display differently on different devices
  – Compatibility with assistive technology

FIGURE 10-15
Web pages display differently on different devices.
Multimedia Web Site Design

• **Assistive technology**: Hardware and software designed for use by individuals with physical disabilities
  - Affects Web design because some content is not compatible with assistive devices
  - Rehabilitation Act requires federal agencies to have accessible Web pages

• **Accessibility tips:**
  - Use alternative text description for all images
  - Use meaningful text-based hyperlinks
  - Use alternative content for Flash, JavaScript, and other types of animated elements
  - Consider creating an alternate text-based page
  - Keep readability in mind
Multimedia Web Site Design

**Figure 10-16**
Some Web page characteristics that are compatible with assistive hardware.
Multimedia Web Site Development

- Web site development: Creating a Web site
  - Occurs after the site is designed
  - Can be performed in-house or outsourced
  - Three basic steps
    - Creating the multimedia elements
    - Creating the Web site
    - Testing, publishing, and maintaining the site
Multimedia Web Site Development

- Creating the multimedia elements
  - Usually several different software programs are used, such as:
    - Image editing software
    - Animation software
    - Audio editing software
    - Video editing software
- Each element should be saved in the appropriate size, resolution, and file format
Multimedia Web Site Development

• Creating the Web site
  – Often a markup language is used
  – Markup language: A coding system that uses symbols or tags to describe what a document should look like when it is displayed in a Web browser
    • Hypertext Markup Language (HTML): The original markup language
    • Uses HTML tags to indicate where effects and elements belong in the Web page
    • Some tags are paired
    • The computer and browser being used still determines exactly how the Web page will display
HTML Tags

• Used to:
  – Assign a title to the page
  – Identify text as headings
  – Mark end of paragraphs
  – Assign typefaces and relative size to text
  – Make text or images hyperlinks
  – Identify where elements (graphics, animations, video clips, etc.) should appear on the page
  – Specify the layout of tables and frames
  – Identify keywords and other meta tags associated with the page
## HTML Tags

### Figure 10-18
Sample HTML tags.

<table>
<thead>
<tr>
<th>TAG</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;html&gt;</code></td>
<td>Marks the beginning and end of an HTML document.</td>
</tr>
<tr>
<td><code>&lt;head&gt;</code></td>
<td>Marks the head section which contains the page title and meta tags.</td>
</tr>
<tr>
<td><code>&lt;title&gt;</code></td>
<td>Marks the title of the Web page.</td>
</tr>
<tr>
<td><code>&lt;body&gt;</code></td>
<td>Defines attributes of an HTML Web document, such as background color, background image, text color, margins, etc.</td>
</tr>
<tr>
<td><code>&lt;h1&gt;</code> to <code>&lt;h6&gt;</code></td>
<td>Formats headings larger or smaller than the regular text in the document; H1 is the largest text.</td>
</tr>
<tr>
<td><code>&lt;img&gt;</code></td>
<td>Indicates an image file to be inserted; includes attributes for filename, display size, alternative text, border, etc.</td>
</tr>
<tr>
<td><code>&lt;a&gt;</code></td>
<td>Creates a hyperlink.</td>
</tr>
<tr>
<td><code>&lt;b&gt;</code></td>
<td>Bolds text.</td>
</tr>
<tr>
<td><code>&lt;i&gt;</code></td>
<td>Italicizes text.</td>
</tr>
<tr>
<td><code>&lt;center&gt;</code></td>
<td>Centers text.</td>
</tr>
<tr>
<td><code>&lt;hr&gt;</code></td>
<td>Inserts a horizontal rule.</td>
</tr>
<tr>
<td><code>&lt;br&gt;</code></td>
<td>Inserts a line break (new line within the same paragraph).</td>
</tr>
<tr>
<td><code>&lt;p&gt;</code></td>
<td>Inserts a paragraph break (starts a new paragraph).</td>
</tr>
</tbody>
</table>
HTML Tags

Web page as displayed in browser.

Click to view the Web page’s source code.

HTML version of the Web page.

Specifies the title displayed on the browser’s title bar.

Defines the table used to lay out the page content.

Creates the navigation button links at the top of the page.

The page’s text begins here with a bold HTML tag.
Multimedia Web Site Development

- Extensible Markup Language (XML): A set of rules for exchanging data over the Web
  - Addresses the content but not the formatting
  - Uses XML tags to identify data
  - Allows data to be extracted and reused as needed

- Extensible Hypertext Markup Language (XHTML): A newer version of HTML based on XML
  - Controls the appearance and format of a Web page like HTML
  - Stricter rules than HTML
  - Beginning to replace HTML
XHTML Tags

• Used for the same purposes as HTML tags
• Stricter:
  – All attribute values must be in quotation marks
  – Tags are lowercase (case-sensitive)
  – Tags must be closed
    • <p> and </p> or <p />
  – Tags must be in proper order
• Main sections of XHTML Web page
  – Declaration statement with XHTML standard used
  – Head statement with title and meta tags
  – Body of the Web page
XHTML Tags

This text is defined as Heading 1

This text is bold and italic.

A horizontal rule comes next.

FIGURE 10-20
A sample XHTML Web page.
Multimedia Web Site Development

- **Dynamic HTML (DHTML):** Used to add dynamic capabilities and interactivity to Web pages.
- **Wireless Markup Language (WML):** Used to create Web pages to be displayed on WAP-enabled devices, such as smart phones.
- **Scalable Vector Graphics (SVG):** Used to describe vector-based images that are to be displayed scalable (in different sizes) on Web pages to match the browser window size.
Multimedia Web Site Development

- Scripting language: Often used for dynamic content
  - Allows the inclusion of scripts (instructions) in the Web page code
  - JavaScript (resembles the Java programming language)
  - VBScript (based on Microsoft’s Visual Basic programming language)
  - Perl (used to write CGI scripts to process data input via a Web page)
- AJAX: A new set of Web standards to create faster and more efficient interactive Web applications
  - Only requests new data from the server, not the entire Web page, when the page is updated
Multimedia Web Site Development

- Other content development tools
  - ActiveX: A set of controls that can be used to create interactive Web pages
    - Extends OLE to integrate content from two or more programs
    - Allows a variety of types of Windows files to be viewed via Web pages
  - Virtual Reality Modeling Language (VRML): A language used to create 3D Web pages
    - Newest version is called X3D
  - MHTML (MIME HTML): A format for transferring all the elements of a Web site together as a single file
Multimedia Web Site Development

- Web site authoring software: Used to create Web pages and complete Web sites
  - e.g. Dreamweaver, Microsoft Expression Web
  - Toolbar buttons, menus, etc. are to create and format the page
  - The appropriate HTML statements are automatically generated
  - Allows you to create an entire cohesive Web site, not just individual pages
  - Allows you to easily include:
    - Forms and database connectivity for more dynamic interactions with your visitors
    - Other helpful development tools, such as tests for broken links and accessibility tests
Multimedia Web Site Development

WYSIWYG EDITING
Most Web site authoring programs allow you to create Web pages by inserting graphics, formatting text, and so on using a menu and toolbar buttons, in much the same way you do when using a word processing program. Typically, hyperlinks, tables, forms, and other elements can be easily created, and video clips, animated objects, and other multimedia elements can be easily inserted.

CODE EDITING
Most Web site authoring programs allow you to view the Web page’s HTML or XHTML code to edit it, if desired. Web page code can also usually be converted, such as from HTML to XHTML, as shown here.

FIGURE 10-22
The Dreamweaver Web site authoring program.
Multimedia Web Site Development

• Testing, publishing, and maintaining the site
  – Hyperlinks should be clicked to ensure they take the user to the proper location
  – Every possible action that could take place with an animated element should be tested
  – Proofread each page or screen carefully
  – Consider a “stress test”
  – Update content and check links on a regular basis
  – XHTML Web pages can be checked with an XHTML validator
FIGURE 10-23
Validating an XHTML Web page.
This Web site (validator.w3.org) can be used to validate XHTML Web pages.

Web pages can be checked before they are published by choosing the File Upload option.

Any coding errors on the Web page will be identified.

Once any coding errors have been corrected, the page will be declared valid.
The Future of Web-Based Media

• Web-based multimedia will be more exciting and more embedded into everyday events
• New types of multimedia will likely be developed to fit our growing need for mobile content
• As Internet users keep moving to broadband, expect to see multimedia sites and TV merge closer together
• Game boxes (Xbox, Sega Dreamcast 2, and Sony PlayStation 2) already have built-in Internet and multimedia capabilities
• Interactive TV and video-on-demand may soon be the norm on the Web
Summary

- What Is Web-Based Multimedia?
- Multimedia Elements
- Multimedia Web Site Design
- Multimedia Web Site Development
- The Future of Web-Based Multimedia