

15th Edition

Understanding Computers

Today and Tomorrow

Comprehensive

Chapter 10

Multimedia and the Web



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Learning Objectives

1. Define Web-based multimedia and list some advantages and disadvantages of using multimedia.
2. Describe each of the following multimedia elements—text, images, animation, audio, and video—and tell how they differ.
3. Briefly describe the basic steps and principles involved with designing a multimedia Web site.
4. List the various tasks involved with developing a multimedia Web site.



Learning Objectives

5. Explain how markup languages, scripting languages, and other tools are used today to create multimedia Web pages.
6. Discuss the possible use of Web-based multimedia in the future.



Overview

- This chapter covers:
 - What Web-based multimedia is and how it is used today
 - The advantages and disadvantages of using multimedia
 - Basic multimedia elements commonly found on Web pages
 - Steps and principles in designing a multimedia site
 - How a multimedia Web site is developed and the software used during this process
 - The future of Web-based multimedia



What Is Web-Based Multimedia?

- Multimedia
 - The integration of a variety of media, such as text, images, video, animation, and sound
- Web-Based Multimedia (also called rich media)
 - Multimedia (sound, video, animation) located on Web pages
- Multimedia Sites
 - Are interactive
 - Often contain elements that users interact with directly
 - Display information as requested by the Web page visitor



What Is Web-Based Multimedia?

- Fast computers and broadband Internet connections make Web-based multimedia much more feasible than in the past
- Vast majority of Web sites today include multimedia (advertisements, TV shows, podcasts, user generated content)
- Why Learn About Web-Based Multimedia?
 - Multimedia is an integral component of the Web
 - Businesses and individuals need to understand the characteristics of the various types of multimedia elements and the impact of adding them to a Web site



Web-Based Multimedia Applications

- Information Delivery
 - Photos of products, video clips and podcasts, and users' manuals are used to convey information
 - Important component in Web-based training (WBT)
- E-Commerce
 - Online catalogs, samples of movies and music, etc.
 - Virtual Reality (VR)
 - The use of a computer to create three-dimensional environments that look like they do in the real world (i.e., homes for sale)
 - Augmented Virtual Reality - overlaying computer generated images on top of real time images



Web-Based Multimedia Applications

- Entertainment
 - Online TV/movies and games are available through TV network sites
- Social Media and Virtual Worlds
 - Photos and videos on many social networking sites
 - 3D Virtual Worlds (Second Life)

Web-Based Multimedia Applications

FIGURE 10-1
Web-based multimedia applications.



Courtesy: Centers for Disease Control and Prevention

INFORMATION DELIVERY

Images, video, audio, and animation are often used to convey information, such as via this Web-based training course offered by the CDC.



Copyright © 2013 VisualFour

E-COMMERCE

Images and video are often used for e-commerce purposes, such as this virtual reality tour of a home for sale.



© 2013 Hulu

ENTERTAINMENT

Video and audio are often used in entertainment applications, such as Web sites like Hulu that offer TV shows for online viewing.



Courtesy Pinterest

SOCIAL MEDIA

Many social media sites such as Pinterest, shown here, include photos and video.



Advantages and Disadvantages of Web-Based Multimedia

- Advantages
 - Can deliver some content that could not be delivered otherwise
 - Can address a variety of learning styles
 - Visual learners
 - Auditory learners
 - Kinesthetic learners
 - Material more interesting and enjoyable
 - Many ideas are easier to convey in multimedia format



Advantages and Disadvantages of Web-Based Multimedia

- Disadvantages
 - Time and cost of development
 - The cost of hosting and delivering the multimedia needs to be considered
 - The impact on visitors that have slow Internet connections or low bandwidth caps



Inside the Industry Box

Military Virtual Worlds

- U.S. military simulations traditionally take months to develop
- Virtual world simulations can be developed much more quickly and requires less personnel and skills
- MOSES is a simulation created using an OpenSim grid
- Can be secured behind firewall



Courtesy of Douglas Maxwell, US Army Research Lab Simulation and Training Technology Center, 2013

Multimedia Elements

- Text
 - Used to supply basic content, and to add text-based menus and hyperlinks
 - Serif Typeface
 - Small lines on edges of letters
 - More readable, used for large bodies of text
 - Sans Serif Typeface
 - No lines on edges of letters
 - Used for titles, headings, Web page banners



FIGURE 10-3

Typefaces. Typefaces are collections of text characters that share a common design and can be either serif or sans serif.



Multimedia Elements

- Different typefaces can convey widely different feelings
- Important to select a typeface that matches the style of the Web site
- When a consistent text appearance is required (such as for a logo) an image containing the text is used instead
- Images (Graphics)
 - Digital representations of photographs, drawings, charts, and other visual images
 - Images are static and are available in many formats—TIF, BMP, GIF, JPEG, and PNG
 - Clip art consists of pre-drawn images
 - Stock photos are also available online

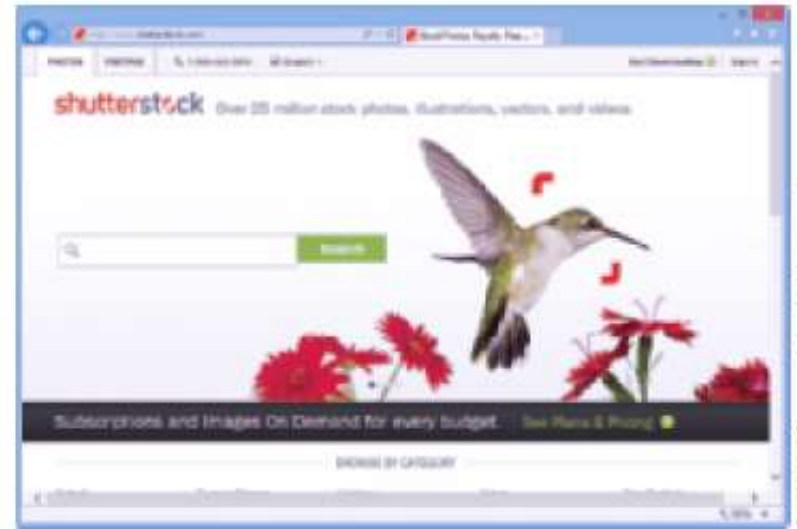
Multimedia Elements



Copyright © 2000-2013 Dreamstime. All rights reserved.

CLIP ART IMAGES

Typically use the PNG or JPEG format and can be downloaded from a variety of Web sites. Some of the images on this site are free for both personal and commercial use.



© 2003-2013 Shutterstock, Inc. All rights reserved.

STOCK PHOTOGRAPHS

Typically use the JPEG format and can be downloaded from stock photograph agencies. The agency shown here has a variety of images organized by topics; all images require a fee for use, but all are royalty free.

FIGURE 10-4

Both clip art and stock photographs are plentiful on the Web.



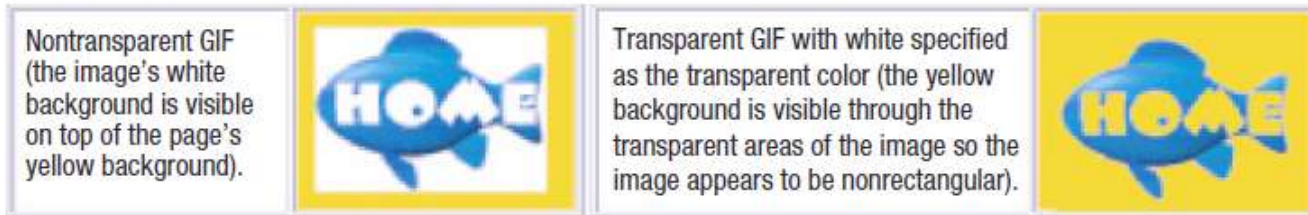
Multimedia Elements

– GIF

- Graphic Interchange Format
- Commonly used for Web page images
- Used with logos, banners, other nonphotographic images
- 256 colors max
- Uses lossless file compression
- Can be transparent
- Can be interlaced

Multimedia Elements

NONTRANSPARENT VS. TRANSPARENT GIFS



NONINTERLACED VS. INTERLACED GIFS

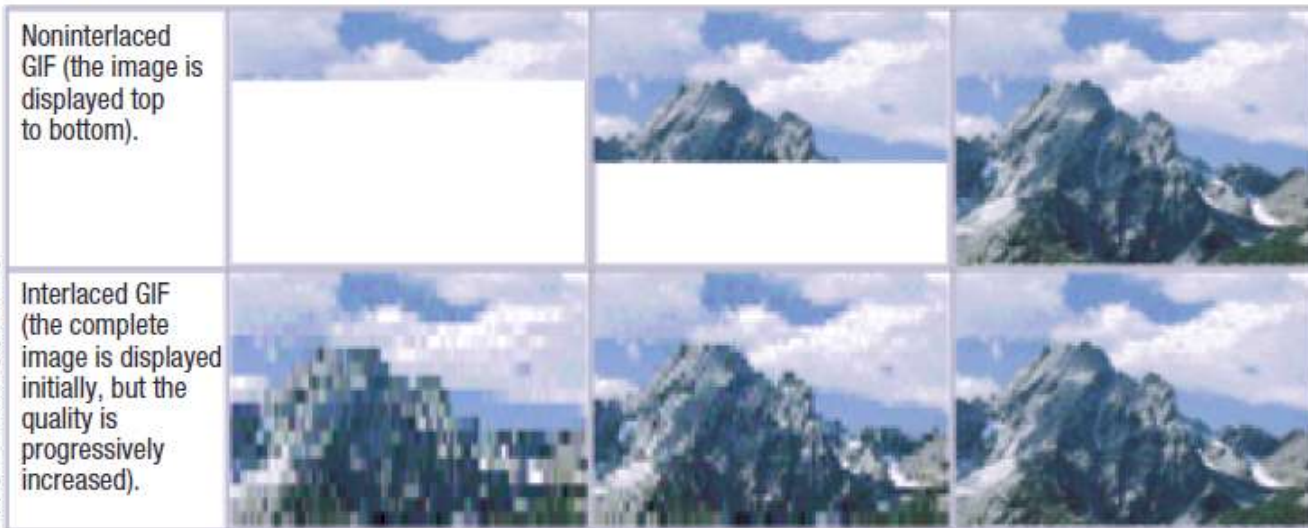


FIGURE 10-5
Transparent and interlaced GIFs.

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Multimedia Elements

– PNG

- Portable Network Graphics
- Format designed specifically for use with Web page images in 1996
- Uses lossless compression
- Can compress more efficiently than GIF
- Can use specific color palette of 256 colors or true color palette of 16 million colors
- Can also be transparent and interlaced



Multimedia Elements

– JPEG

- Joint Photographic Experts Group
- Standard format for Web page photos
- Uses lossy file compression
 - Image quality is lost during compression
- Can use true color
- Can be progressive
- The amount of compression is specified when the file is saved

Multimedia Elements



No compression
(37 KB)



40% compression
(13 KB)



80% compression
(7 KB)



100% compression
(3 KB)

FIGURE 10-6

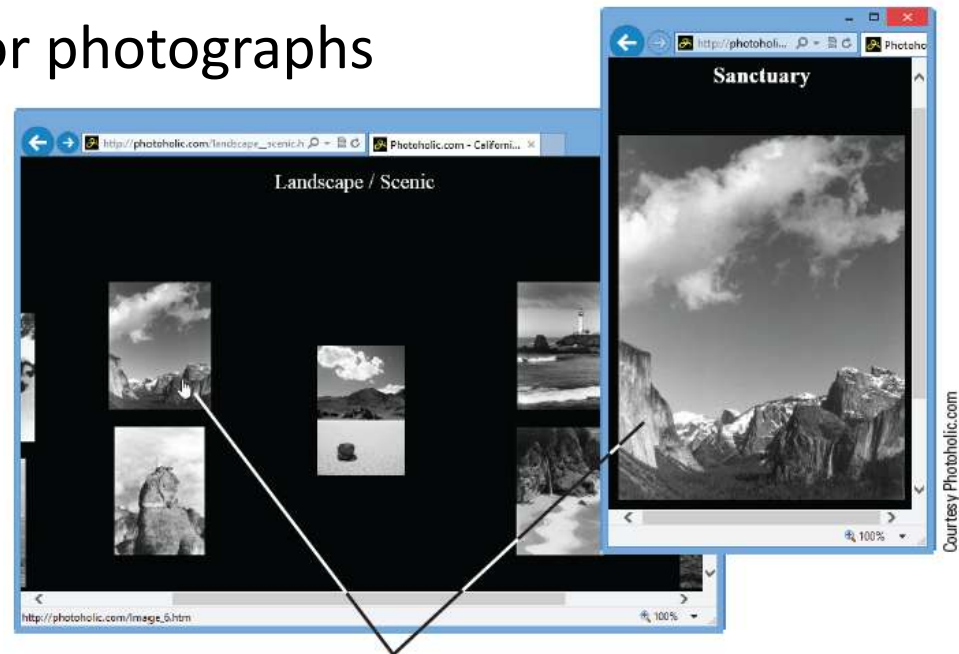
The amount of compression in a JPEG file affects both the file size and the display quality.

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Multimedia Elements

- Choosing a Graphic Format
 - GIF or PNG—typically used for line art (clip art, logos, navigation buttons, etc.)
 - JPEG—typically used for photographs
 - Use thumbnail images when very large images are required

FIGURE 10-7
Thumbnail images.



Clicking a thumbnail image displays the full-sized 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 that is inserted in a Web page
 - Displayed one after another to simulate movement



Multimedia Elements

- For more complex animations, developers can use JavaScript or another scripting language
 - Flash, Silverlight
- Many Web-based animations require a plug-in
- Animation and interactivity can also be achieved using programming languages
- 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



Multimedia Elements

- 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:
 - Waveform (.wav)
 - Moving Picture Experts Group Audio Layer 3 (.mp3)
 - Audio Interchange Format File (.aiff)
 - Advanced Audio Coding (.aac or .m4a)

How It Works Box

MP3 Compression

- Patented compression method; MPEG Audio Layer 3
- Typically compresses a CD-quality song to 1/10th of its size
- Used with Internet music downloads
- Uses perceptual coding and Huffman coding





Multimedia Elements

– Video

- Begins as a continuous stream of visual information, which is then broken into separate images (frames) when the video is recorded
- Video data, like audio data, is usually compressed
- Streaming video is recommended to speed up delivery
- Common video file formats include:

.avi	.mp2	.mov
.flv	.mp4	.wmv



Quick Quiz

1. The most common file format for Web page photographs is _____.
 - a. GIF
 - b. JPEG
 - c. PNG
2. True or False: Delivery speed is one potential disadvantage of using Web-based multimedia.
3. A small image that is linked to a larger version of the same image is called a(n) _____.

Answers:

1) b; 2) True; 3) thumbnail image



Multimedia Web Site Design

- Web Site Design
 - The process of planning what a Web site will look like and how it will function
 - Good planning is very important
- Basic Design Principles
 - Web pages should be interesting and exciting applications
 - Provide information of value or interest
 - Provide a stimulating experience
 - Pages should load quickly and be easy to use



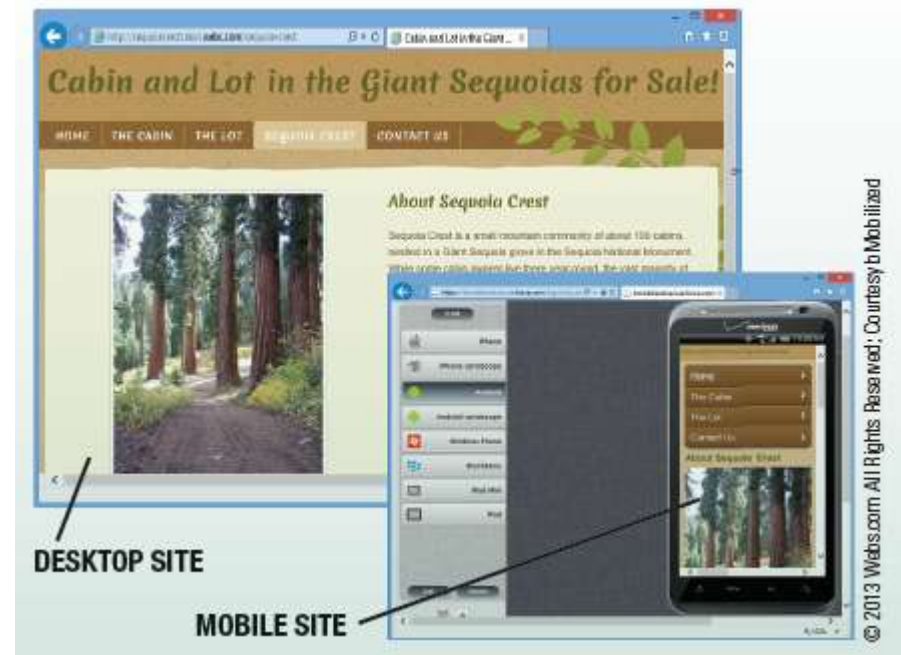
Multimedia Web Site Design

- Plan for all needed delivery methods and devices
 - Features that require a specific browser
 - Features that require little used plug-ins
 - The size of the page content
 - Different devices, browsers, and screen resolutions affect how Web pages display
 - High-bandwidth items
 - Watch image file size (use thumbnails)
 - Use links to audio, video, and other high-bandwidth items
 - Use streaming audio and video

Technology and You Box

Responsive Web Design (RWD)

- Focuses on building sites that are compatible with a variety of devices
- Can create multiple versions of your site yourself or use a flexible site that adjusts to each visitor's device
- Can create a desktop site and use a service to generate mobile versions





Determining the Objectives and Intended Audience of the Site

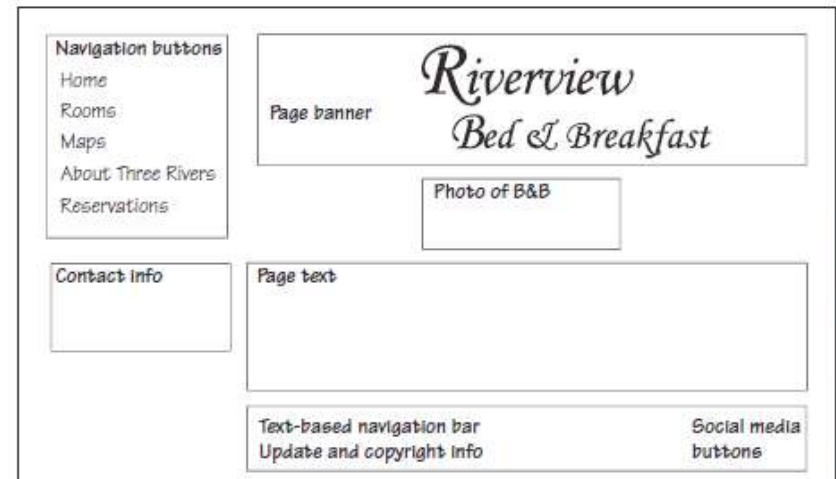
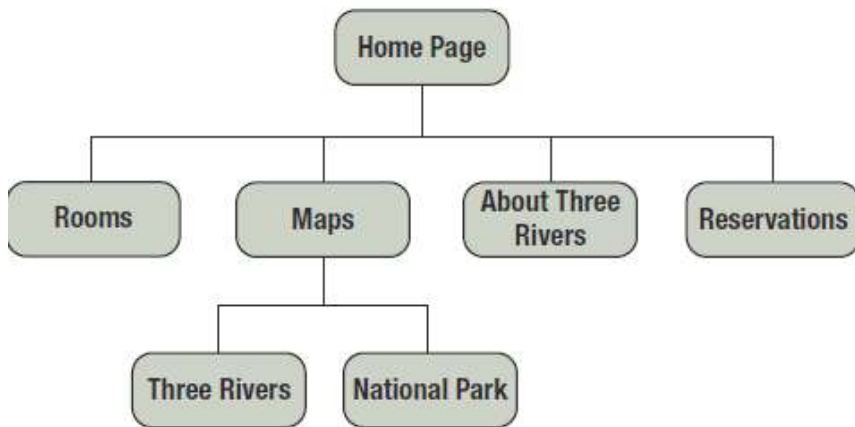
- One of the first steps in designing a multimedia application or Web site
- Objectives of the site affect its content
 - Main purpose
 - Supplemental activities and social media tie-ins
- Intended audience affects the appearance (such as the style, graphics, fonts, and colors) of the site
- Once the objectives and audience have been identified, you should have a good idea of the main topics to be included in the site



Using Flowcharts, Page Layouts, and Storyboards

- Flowchart
 - Used during the Web design process to illustrate how the pages in a Web site relate to one another
- Page Layout
 - Illustrates the basic layout and navigational structure of a Web site
 - Typically two are created: one for the home page and one for the rest of the pages in the site
- Storyboard
 - Ordered series of sketches showing each page or screen in an animation sequence

Using Flowcharts, Page Layouts, and Storyboards



FLOWCHARTS

Describe the logical organization of the site. Each box represents a separate Web page.

FIGURE 10-12

Web site flowcharts and page layouts.

A sample flowchart and page layout for a bed-and-breakfast Web site are shown here.

PAGE LAYOUTS

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



Navigational Design Considerations

- Users should be able to get to most pages on the site within three mouse clicks
 - Using site maps and drop-down menus with larger Web sites will help
- Navigational items should be placed in the same location on every page
- Break long pages into multiple pages
- Add a text name to images
- A link to the home page should appear on every page
- Include identifying information on each page to indicate which page is currently displayed

Navigational Design Considerations

SOCIAL MEDIA BUTTONS

Gives visitors quick and easy access to the Web site's social media pages.

SEARCH BOX

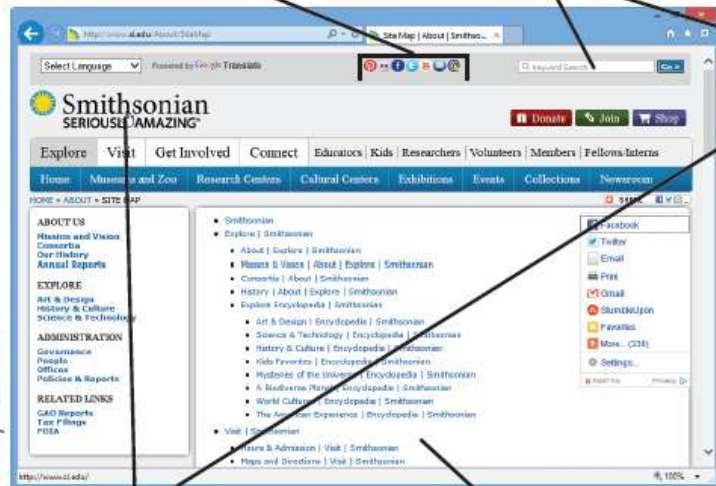
Allows users to find pages on the site containing specific information.

MENU TABS

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

ICONS

Help users identify navigational links.



Courtesy Smithsonian

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.

SITE MAP

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



NAVIGATION BAR

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

FIGURE 10-13
Navigational tools.

A wide variety of navigational tools exists to help make Web sites easy to use.

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Access Considerations

- Device Compatibility
 - The device being used to access a Web site affects how the site will appear and how functional it will be
 - Develop a plan for mobile access of your site
- Assistive Technology
 - Hardware and software specially designed for individuals with physical disabilities
 - Screen readers and Braille displays
 - Alternative text (alt tags)
 - Also watch reading level of site

Access Considerations



ALTERNATIVE TEXT

Images have alternative text descriptions.

COLORS AND CONTRAST

There is a high degree of contrast between the text and the background colors to make the text as readable as possible.

DESCRIPTIVE AND UNDERLINED HYPERLINKS

Hyperlinks make sense when read aloud; hyperlinks that are not part of a navigation bar are underlined.

FIGURE 10-15

Some Web page characteristics that are compatible with assistive technology.



Quick Quiz

1. Which of the following is most often used to illustrate what a Web page will look like?
 - a. Flowchart
 - b. Storyboard
 - c. Page layout
2. True or False: In order for a screen reading program to identify an image-based hyperlink, alternative text must be assigned to that image.
3. A Web page that contains links to all the main pages on a Web site is called a(n) _____.

Answers:

1) c; 2) True; 3) site map



Multimedia Web Site Development

- Web Site Development
 - The process of creating, testing, publishing, and maintaining a Web site
 - Occurs after the site is designed
 - Can be performed in-house or outsourced
- Creating the Multimedia Elements
 - Usually several different software programs are used
 - Image editing and animation software
 - Audio and video editing software
 - Each element should be saved in the appropriate size, resolution, and file format



Multimedia Web Site Development

- Creating the Web Site
 - Markup Language
 - Uses symbols or tags to describe what a document should look like when it is displayed in a Web browser
 - JavaScript or other scripting languages can be used to add dynamic content
 - Web site authoring software is often used to create an entire site



Multimedia Web Site Development

- 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

TAG	PURPOSE
<html></html>	Marks the beginning and end of an HTML document.
<head></head>	Marks the head section, which contains the page title and meta tags.
<title></title>	Marks the title of the Web page.
<body></body>	Contains all the content of the Web page, including text, hyperlinks, and images.
<h1></h1> to <h6></h6>	Formats headings larger or smaller than the regular (non-heading) text in the document; H1 is the largest text.
	Indicates an image file to be inserted; attributes included within this tag specify the image filename, display size, alternative text, title, border, etc.
<a>	Defines a hyperlink using the specified URL; can include an image filename, hyperlink text, and other attributes.
	Bolds text.
<i></i>	Italicizes text.
<!-- -->	Indicates a comment that won't display when the Web page is viewed.
<hr>	Inserts a horizontal rule.
 	Inserts a line break (new line within the same paragraph).
<p>	Inserts a paragraph break (starts a new paragraph).

FIGURE 10-17
Sample HTML tags.

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Multimedia Web Site Development

Web page as displayed in browser.

Right-click page and then click this option to view the Web page's source code.

HTML source code for the Web page.

This is an XHTML page.

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

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The page is organized using a table; the right column starts here.

The page's text begins with a heading.

Defines a photo's title, source, and alt text.

FIGURE 10-18
An HTML Web page and its corresponding source code.



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



Multimedia Web Site Development

- HTML5
 - Newest version is designed to replace the previous versions of both HTML and XHTML
 - Includes new tags and features that support the creation of more complex and dynamic Web pages
 - Is open standard
 - No proprietary software or plug-ins required
 - New tags include `<video>` and `<audio>` for media, `<canvas>` that creates a bitmapped surface to work with, and section tags to identify the parts of a Web page (`<header>`, `<article>`, `<nav>`, etc.)

Multimedia Web Site Development

DECLARATION
Indicates this is an HTML page.

HEAD
Indicates the page title and character set being used.

BODY
Contains the body of the Web page (header, sections, and footer).

HTML closing tag ends the Web page.

```
A Simple HTML5 Web page.html - Notepad
File Edit Format View Help
<!DOCTYPE html>
<html>
  <head>
    <title>A Simple HTML5 Web Page</title>
    <meta charset="UTF-8">
  </head>
  <!-- THIS IS A COMMENT - IT WON'T DISPLAY WHEN THE WEB PAGE IS VIEWED -->
  <body>
    <header>This is the header; it contains this text and the sample nav bar below.
      <nav>
        <a href="http://mywebsite.com">Home</a>
        <a href="http://google.com">Google</a>
        <a href="http://dictionary.com">Dictionary.com</a>
      </nav>
    </header>
    <section>
      <p>This is the first section of the page. It can be divided into articles.</p>
    </section>
    <section>
      <p>This is the second section of the page.
        <b>This text is defined as Heading 1.</b>
        <b>This text is bold.</b>
        <p>This text is in a new paragraph. A video link comes next.
          <video src="video_sample.mp4" type="video/mp4">
        </video>
        <p>This is another new paragraph. A horizontal rule comes next.
      </p>
    </section>
    <footer>This is the footer; it contains this text.
  </footer>
</body>
</html>
```

HTML5 file being created in Notepad.

Comments don't display in a browser.

Nav bar code contains hyperlinks.

HTML5 file being viewed in Internet Explorer.

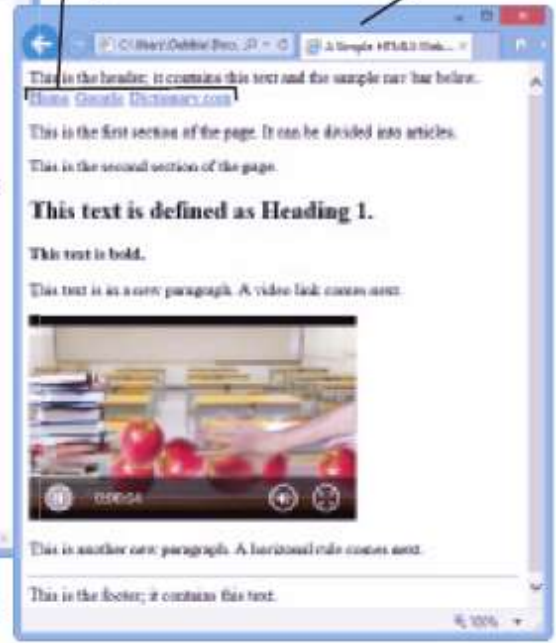


FIGURE 10-19
An example of HTML5 source code and its corresponding Web page.



Multimedia Web Site Development

- Cascading Style Sheets (CSSs)
 - Used to specify the styles used with a Web page or an entire Web site
 - Specified in an Internal style sheet (head section of Web page) or in an External style sheet
 - Normally used in an external style sheet and connected to web pages through a link statement in the head section of the desired pages
 - Styles are applied to all of the linked Web pages at one time
 - Improves consistency and efficiency



Multimedia Web Site Development

- Wireless Markup Language (WML)
 - Used to create Web pages to be displayed on WAP-enabled wireless devices, such some older mobile phones
- Scripting Languages
 - Used with Web pages with lots of dynamic content
 - Allows the inclusion of scripts (instructions) in the Web page code
 - JavaScript, VBScript, Perl



Multimedia Web Site Development

- AJAX
 - Creates faster, more efficient interactive Web applications
 - Only requests new data from the server, not the entire Web page, when the page is updated
 - Interactive Web pages built with AJAX run faster
 - Normally require less bandwidth than conventional Web applications



Multimedia Web Site Development

- ActiveX
 - Set of specifications for reusing software components that can be used to integrate multimedia and other interactive elements into Web pages
 - Extends OLE (Object Linking and Embedding) 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) and X3D
 - A language used to create 3D Web pages
 - Successor is X3D

Trend Box

Push Technology and xRTML

- Conventional Web pages have the user pull data from the server
- Push technology delivers content automatically as it becomes available
- One emerging option for Web sites and apps for all devices is xRTML
- Delivers data in a timely manner and saves data transfer costs

The image shows two browser windows. The top window displays the source code for an xRTML poll application. The code includes a <xrtml:poll> tag with various attributes and nested <xrtml:connection> tags for data retrieval and display. The bottom window shows the rendered application, titled 'THE ACME OF REALTIME', featuring a bar chart titled 'WHERE ARE YOU FROM?' with a legend for USA, CANADA, RUSSIA, AFRICA, and LATIN AMERICA. The chart shows the number of votes for each region, with CANADA having the highest number of votes. A 'Poll' button is visible at the bottom of the chart area.

xRTML code for a polling app.

The graph changes automatically as votes are cast.



Multimedia Web Site Development

- Web Site Authoring Software
 - Used to create Web pages and entire Web sites (Dreamweaver)
 - Appropriate JavaScript or other code is automatically generated
 - Allows you to create an entire cohesive Web site, not just individual pages
 - Allows you to easily include forms and database connectivity
 - Often includes tests for broken links & accessibility tests
 - Web site builder – cloud versions

Multimedia Web Site Development

Adobe product screenshots (s) reprinted with permission from Adobe Systems Incorporated.

WEB SITE AUTHORIZING PROGRAMS
Allow you to create the Web site by inserting images, text, hyperlinks, and more; you can view and edit the HTML code as needed.


WEB SITE BUILDERS
Allow you to create the Web site online by inserting images, text, hyperlinks, and more; you typically cannot view and edit the HTML code.

Home page being created.

Current HTML for the Home page.

Home page being created.

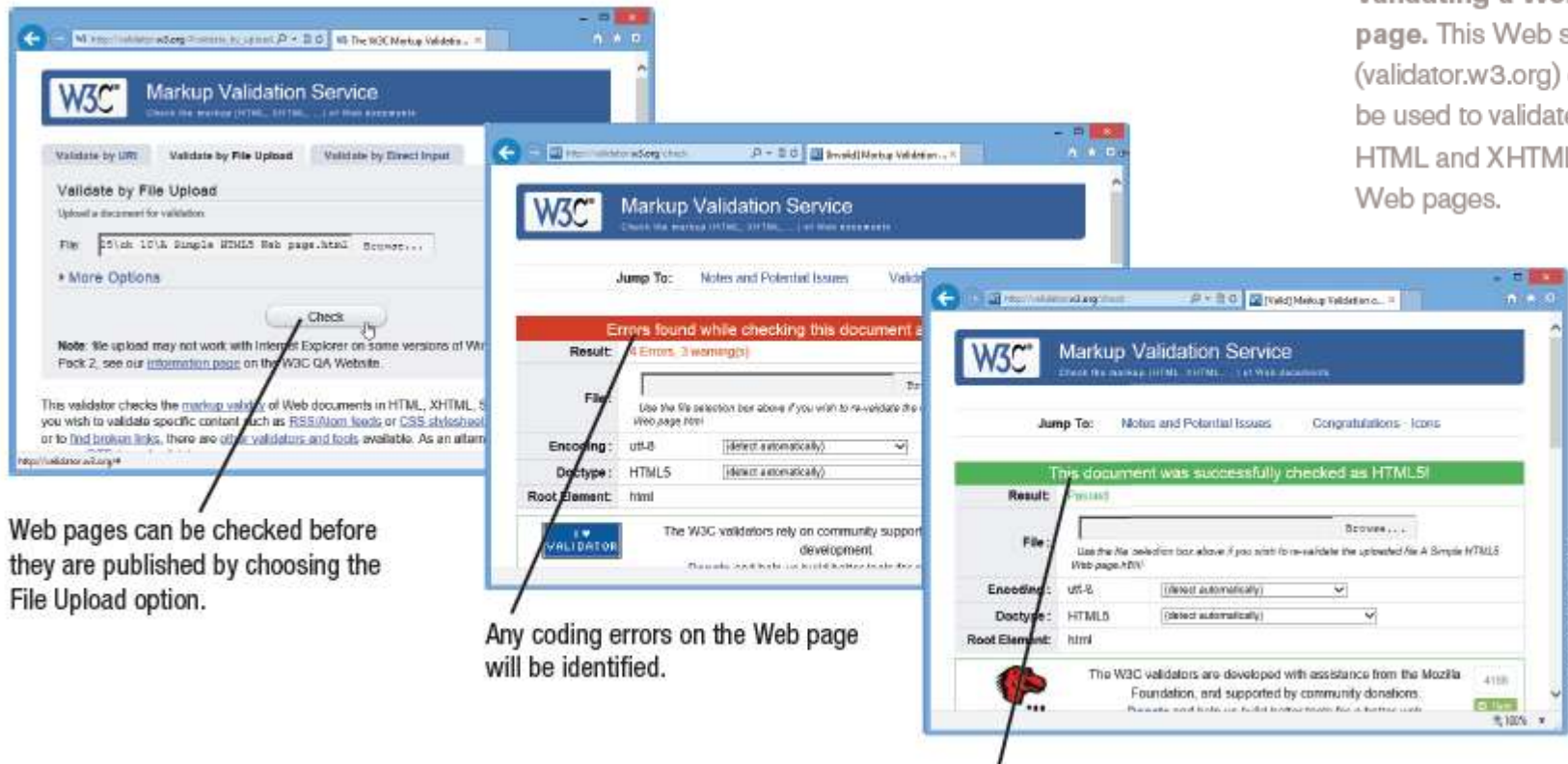
FIGURE 10-20
Creating a Web site.



Testing, Publishing, and Maintaining the Site

- Web site should be thoroughly tested prior to publishing
 - All hyperlinks should be clicked to ensure they take the user to the proper location
 - Complex animations (such as games and tutorials) should be tested individually
 - Proofread each page or screen carefully
 - Use Web page code validators built into Web site authoring programs or online validator services
 - Consider a “stress test”

Testing, Publishing, and Maintaining the Site




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.

FIGURE 10-21
Validating a Web page. This Web site (validator.w3.org) can be used to validate HTML and XHTML Web pages.



Testing, Publishing, and Maintaining the Site

- Once thoroughly tested, Web site is ready to be published
 - Identify Web server
 - Upload files
- After publishing, the Web site must be maintained
 - Update content and check links on a regular basis
 - Site should be evaluated on a regular basis to locate areas needing improvement



The Future of Web-Based Multimedia

- Web-based multimedia will be more exciting and more embedded into everyday events
- Web-based content, cloud services, and home entertainment devices will likely continue to converge to allow seamless access to desired content on the user's device of choice
- Technology will evolve to support mobile multimedia
- Usage of multimedia applications that are tied to a geographical location or current status and that involve user-generated content will also likely continue to grow



Quick Quiz

1. Which of the following markup languages is most often used to create Web pages?
 - a. HTML
 - b. JavaScript
 - c. WML
2. True or False: Web site authoring software can typically be used to create all of the Web pages on a site, including adding animated elements, video clips, etc.
3. The HTML code _____ would begin to bold Web page text.

Answers:

*1) a; 2) True; 3) *



Summary

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