COS30043
Interface Design and Development

Lecture 1 – Introduction

2021 – Semester 1

1

Contents

- Web Development
- Web Programming
- Languages
- Frameworks
- Usability
- Accessibility

2

UNDERSTANDING WEB DEVELOPMENT

WHO SHOULD I BECOME?
WHAT HARDWARE SHOULD I HAVE?
WHAT SOFTWARE SHOULD I INSTALL?
WHAT LANGUAGE SHOULD I LEARN?

3

Web Development – The People

- **Web developer** is a programmer who specialises in the development of a web site. Web sites can
  - Be simple and static
  - Have complex applications
- **Webmaster** is someone that has knowledge of web page design, authoring, and development, and is a person responsible for
  - maintaining websites
  - monitoring Web site traffic and ensuring that the Web site's hardware and software are running properly

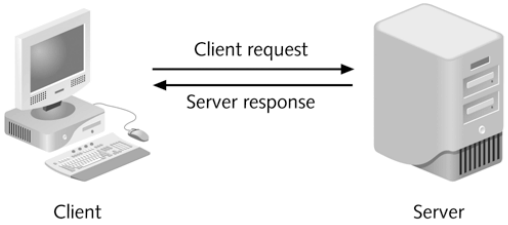
4

Web Development – The Hardware

- **Server** ("back end")
  - Responsible for data storage and management, often a database from which a client requests information
  - Fulfills a request for information by managing the request or serving the requested information to the client
- **Client** ("front end")
  - Presents an interface to the user
  - Gathers information from the user, submits it to a server, then receives, formats, and presents the results returned from the server

Web Development – The Hardware

- A system consisting of a client and a server is known as a **two-tier** system



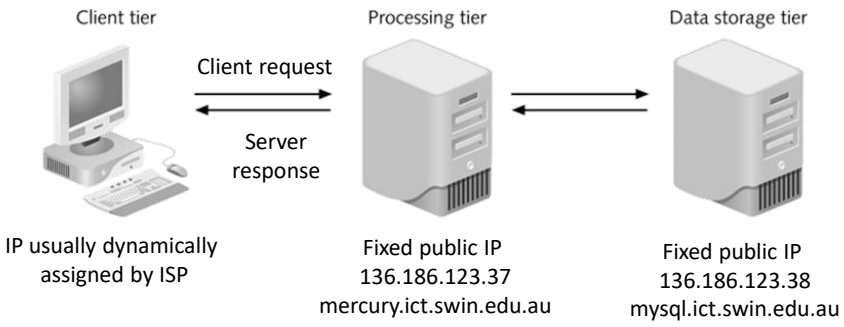
The design of a two-tier client/server system

- Note the client and server are referring to the physical machine in this illustration

Web Development – The Hardware

- A **three-tier**, or **multi-tier**, client/server system consists of three distinct pieces:
  - Client tier, or user interface tier
  - Processing tier, or middle tier, or business logic tier, handles the interaction between the client and the data storage tier
    - Performs necessary processing or calculations based on the request from the client tier
    - Handles the return of any information to the client tier
  - Data Storage tier, or data tier, or information tier, manages the databases

Web Development – The Hardware



The design of a three-tier client/server system

Web Development – The Software

- **Server software** refers to software that runs on the server machine, examples are
  - **OS** – Windows Server, Linux Server
  - **Web** – Apache, Microsoft Internet Information Services
  - **Database** – MS SQL, MySQL
  - **Script Support** – NodeJS (JavaScript), Apache Tomcat (Java Server Pages (JSP)), Microsoft ASP – (Active Server Pages (ASP)), Adobe ColdFusion, Perl, PHP, Python, Ruby
    - Note: Avoid confusing the software name with the language
  - Others – Microsoft Exchange

Web Development – The Software

- **Client software** refers to the software the runs on the client machines to communicates with a server, examples are
  - **OS** – (Windows, Linux, OSX)'s telnet, FTP
    - Third party – putty, WinSCP, CyberDuck
  - **Web** – Internet Explorer, Firefox, Chrome, Opera, Safari
  - **Database** – MySQL Workbench
  - **Script Support** – usually part of web software
  - **Others** – Outlook, Thunderbird

Web Development – The Languages

- **HyperText Markup Language (HTML)** is a markup language designed to specify structure and content of a web page
  - HTML is NOT a "programming" language
  - HTML is NOT a "formatting" language
- **Cascading Style Sheets (CSS)** a simple markup language for adding style (e.g., fonts, colors, spacing) to Web documents.
- **Client-side scripting (JavaScript)** is a language that runs on a client's browser (client tier) instead of on a Web server (processing tier)

Web Development – The Languages

- **JavaScript** is a scripting language that is primarily use to add programmability to web pages.
  - uses syntax influenced by the language C.
  - JavaScript copies many names and naming conventions from Java
- **JavaScript** allows you to:
  - Turn static Web pages into applications such as games or calculators
  - Change the contents of a Web page after a browser has rendered it
  - Create visual effects such as animation
  - Control the Web browser window itself

Web Development – The Languages

Server-side scripting refers to a scripting language that is executed at a Web server

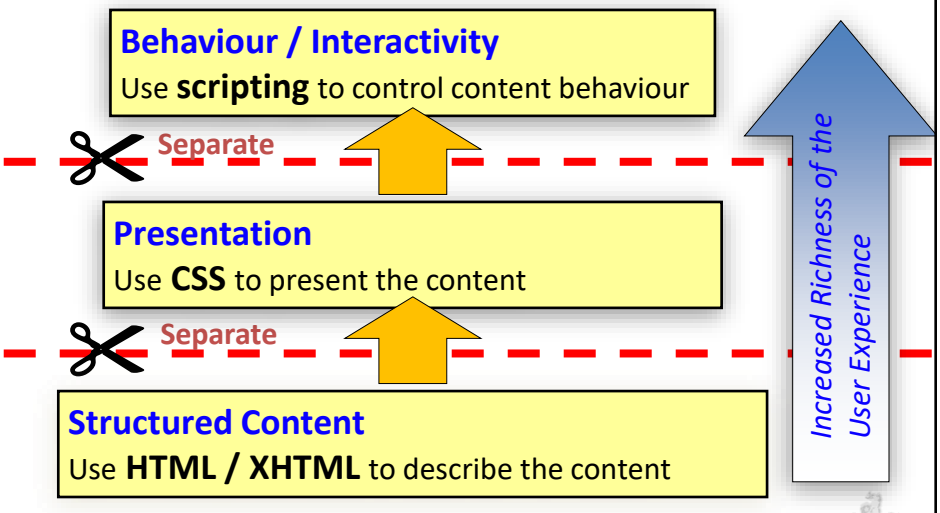
- **Hypertext Preprocessor (PHP)** is a server-side embedded scripting language that is used to develop interactive Web sites
  - Includes object-oriented programming capabilities
  - Supports many types of databases (MySQL, Oracle, Sybase, ODBC-compliant)
- **Others** - Active Server Pages (ASP), ASP.NET, Cold Fusion, … and more

Web Development – The Languages

General rule:

- Use client-side scripting to handle user interface processing and light processing, such as validation;
- Use server-side scripting for intensive calculations and data storage

Web Development – The Process



Work from the bottom up !

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15

FRAMEWORKS

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16

Bootstrap

- an open-source front end web framework
- provides typography, forms, buttons, navigation and other interface components, as well as optional JavaScript extensions for the development of dynamic websites and web applications

VueJS

- Vue.js (commonly referred to as Vue; pronounced like "view") is an open-source front end JavaScript framework for building user interfaces and single-page applications.
- Vue was created by Evan You, and it was first released the in February 2014.

USABILITY

Web Usability Resources

- Usability.com

  http://usability.gov/

  Step-by-Step Usability Guide.
  Website provided by US Government.

- Jacob Nielson- the king of usability :

  https://www.nngroup.com/people/jakob-nielsen/

  https://www.nngroup.com/articles/usability-101-introduction-to-usability/

Usability

Web 'sites' are complete abstractions
- they don't exist, except in our heads.

When we identify a site as such, what we're really describing is a collection of individual linked pages that share a common graphic and navigational look and feel.

- Web Style Guide 3 Ed.

http://www.webstyleguide.com/wsg3/6-page-structure/3-site-design.html

When confronted with a new and complex information system, users build mental models.

http://webstyleguide.com/wsg3/3-information-architecture/3-site-structure.html

Usability

- Usability issues should be considered right from the start of web site design.
- This includes the overall *architecture* of the pages/content and how it is linked together,
- Includes individual *page layouts*, and *common navigational features*, tools and aids that influence how a website is used.

Usability

- Usability is about the purpose or use that visitors have, and how they utilise a web site to achieve goals (tasks).
- Good Usability is *also* about ensuring good accessibility
  - websites should be accessible to all users, all devices
  - accessibility is so important it has it's own requirements!

Usability: Web Design Consideration

- Usability does not simply refer to the "visual" design of a site. It also concerns
  - Ease of **learning**
  - Ease of **navigation**
  - Ease of **undoing** actions
  - Ease of **access** for different groups of users
  - Ease of **task** completion
  - Ease of **reading**

Usability: Web Design Consideration

- **Usability** may be constrained by **Universal Design Issues:**
  - Older equipment
  - Limited bandwidth
  - Language
  - Learning styles
  - Low literacy
  - Screen glare
  - Noisy environment
- and the users needs are *rapidly changing:*
  - people age
  - people's skills, knowledge, experiences change
  - technologies change

Usability: Universal Design Issues

Rural access – Limited Bandwidth

- Slow modems, connections, computers
  - users need good network and interface alternatives
- Too many images, multimedia - provide text alternatives
- Images used for layout, (spacers, text as images) - use Style sheets instead
- Unclear navigation – better organisation

Usability: Universal Design Issues

Older or Limited Technology

- Limited screen resolution / limited colour range
- Limited computer memory
- Old computers with old browsers
- Not able to handle plug-ins, or JavaScript
- No mouse / pointing device

Usability: Universal Design Issues

Aging Population

- Users may need to be able to **alter user interface**: font size, mouse pointer size, magnify screen, set preferred style sheets
  - Most browsers have built-in ability for users to change font size: Ctrl +, Ctrl –, Ctrl 0
- Most operating systems have the ability to alter the mouse pointer size

Usability: Universal Design Issues

- Usability may be constrained by whether the web site or web application has the right volume of information, or the right number of users (critical mass). For example,
  - a photo sharing site without photos,
  - a discussion board without contributors,
  - a game without players

Usability: Universal Design Issues

- **Usability** may be constrained by whether the web site or web application has the *right type of interaction*
- There are many types of user **interaction** that can occur with information and people on the web, such as
  - 1 to 1
  - 1 to Many
  - Many to Many

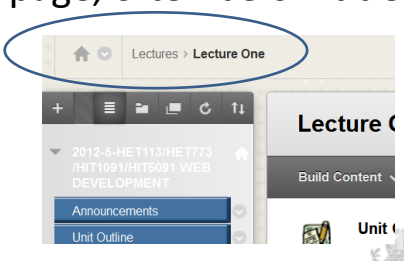
➢Wikis
➢Discussion Boards /Forums
➢Blogs
➢CMS

➢Distributed messaging
➢Real-time communication
➢Real-time remote computing
➢Remote information retrieval

USABILITY:
BEST PRACTICES

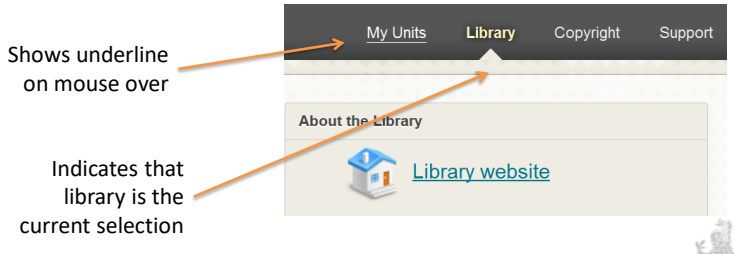
Best Practices: Ease of Navigation

- **Breadcrumbs** or **breadcrumb trail** allows users to keep track of their locations within programs or documents.
- Breadcrumbs typically appear horizontally across the top of a web page, often below title bars or headers.
- Provide a site map or site search feature



Best Practices: Navigation Bars

- Clear navigation bars allows users to know where to go next
  - Use vertical list or horizontal tab list
  - Add visual effect and indicate current selection/location



Best Practices: Page Length

- Webpages is considered long if it is three or more screens lengths
  - Consider breaking to multiple short pages using linear organisation
- If required to be a single file
  - Provide a table of contents or a bullet list at the top of the page that links to specific parts of the page

Best Practices: Design Principles

- Repetition – repeat visual elements (shape, colour, font, images) throughout design
- Contrast – Add visual excitement and draw attention, dark text on medium to light background provides easy reading
- Proximity: group related items
- Alignment: align elements (horizontally or vertically) to create visual unity

Best Practices: Webpage Design Factors

- Load time – limit the total size of a webpage, including all associated images and media files
  - On a 56kps connection, it takes about 8 seconds to load a 60kb webpage
- Perceived load time – limit the time a visitor is aware of waiting
  - Break a long page
  - Split a large image into smaller images, since graphics are displayed as it load

Best Practices: Webpage Design Factors

- Above the fold
  – place important and interesting content on the viewable portion of the page
- Webpage "Real Estate"
  – place important information and navigation on the upper left and top centre of the page
- Horizontal scrolling
  – avoid horizontal scrolling
  – use percentage of layout width

37

Best Practices: Webpage Design Factors

- Adequate white space
  – place blank or white space around blocks of text to increase readability
- Target audience: *Use of colour*
  – Younger audience prefer bright, lively colours
  – Late teens and early twenties prefer dark background with occasional bright contrast and dynamic navigation
  – Older audience prefer light backgrounds, well defined images and large text

38

Best Practices: Webpage Design Factors

- Target audience: *Reading level*
  - Match reading level and style of writing to the audience
  - Use vocabulary that they are comfortable with
- Target audience: *Animation*
  - Use animation only if it adds values to your site, not because you have one in your library
- Browser friendly – test webpages on popular browsers, not only in your favourite browser

Best Practices: Text Design

- Use common fonts, sans serif fonts are easier to read, serif fonts were originally designed for printing
- Be careful on font sizes (12 point or medium)
- Use appropriate colour
- Hyperlink keywords or phrases, not sentences and avoid words like "Click here"
- Be concise (short sentences, bullet list)
- Check spelling and grammar

Best Practices: Graphic Design

- Choose colours from the Web Colour Palette to have the most consistent display
- Use anti aliased text in images
- Use only necessary images
- Keep both file size and dimension of images small
- Ensure that site is usable if images are not displayed

USABILITY:
TESTING WEBSITE USABILITY

Test: Why?

- increase in productivity
- decrease in user training requirements
- decrease in calls to the Help Desk and need for technical support
- decrease in user error rate
- decrease in programming costs associated with late design
- decrease in maintenance costs.

43

Test: What? Task Completion

- develop a testing plan which describes the testing approach you are using
- define the goals and scope of the testing linked with specific user interactions in terms of
  - Performance
    - What should the user be able to do?
  - Conditions
    - Under what conditions should the user be able to do it?
  - Criteria
    - How well must it be done?

44

Test: What? Information Architecture

- focuses on testing, improving and refining the information architecture in terms of
  - design
    - page design, readability, layout, graphics, scrolling
  - finding information
    - navigation, category names, links
  - understanding information
    - content quality and presentation
  - search
    - quality of search results

Test: When?

- at the website's conception
  (test on the printed mockup of the home page)
- before planning a redevelopment
- repeatedly during (re)development, as critical pages or sections are prepared
- when traffic analysis shows an anomaly
- when the owner requires hard information about a page or site

Test: Myth

- pointless because we won't make changes anyway
- just get overruled through 'design by committee'
- takes too long
- costs too much
- impossible to convince management to run tests
- not needed because my site is perfect

47

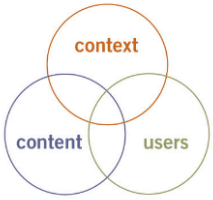
Test: Myth

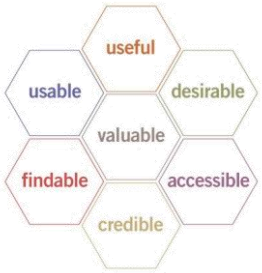
- impossible to show the value of testing
- users don't care about usability
- requires an Human Computer Interaction degree to understand usability
- designers already know what they are doing, they don't need to run usability tests
- had tested the site in the past, there is no need to test again
- too difficult to get started

48

Usability: Other Ideas / Models

- User Experience (UX) Design:
  http://semanticstudios.com/publications/semantics/000029.php





- Findability:
  As the web becomes more and more complex, being able to be found becomes more important
  http://www.alistapart.com/articles/findabilityorphan/

ACCESSIBILITY: WCAG 2.0

What is Web Accessibility?

- **Web accessibility** means that people with disabilities can use the Web
- More specifically, **Web accessibility** means that people with disabilities can ***perceive, understand, navigate,*** and ***interact*** with the Web, and that they can *contribute* to the Web.
- **Web accessibility** also helps older people with changing abilities due to aging, and those who have temporary impairments.

W3C Introduction to Web Accessibility:
http://www.w3.org/WAI/intro/accessibility.php

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51

WCAG 2.0

- Web Content Accessibility Guidelines (WCAG) is a stable, reference-able technical standard.
- has **12 guidelines** that are organized under **4 principles:** perceivable, operable, understandable, and robust.

  http://www.w3.org/WAI/WCAG20/quickref/
- has been endorsed by all levels of Government in Australia
  - This is one of the mandatory requirements for Australian Government agencies to consider when developing and maintaining their online presence.

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52

Accessibility: Guidelines, Policy & Legislation

Australian Disability Discrimination Act
Web Accessibility: Advisory Notes

Individuals and organisations who provide goods and services over the Internet *need to make their websites accessible to people with disabilities*.

Australian Human Rights and Equal Opportunity Commission (HREOC) ***Advisory Notes***, draws attention to resources that will help authors and designers *make Worldwide Web documents accessible*.
http://www.hreoc.gov.au/disability_rights/standards/www_3/www_3.html

The ***Advisory Notes*** also advises how web designers and website owners can ***avoid disability discrimination***, *without sacrificing the richness* and variety of communication offered by the World Wide Web.

See also:

determination against Sydney Olympic Games Organising Committee:
http://www.hreoc.gov.au/disability_rights/decisions/comdec/2000/DD000120.htm

Accessibility: Guidelines, Policy & Legislation

WCAG 2 Who uses it?

– Australian Government –

- Commonwealth departments and agencies are obliged by the Disability Discrimination Act 1992 to ensure that online information and services are accessible by people with disabilities.
- Must conform to at least WCAG 1 Priority 1/ Priority 2 Checkpoints (dependent on level of government)

– The Banking Industry –

Standards for Internet Banking must conform to WCAG Priority 1 & Priority 2 Checkpoints

WCAG 2.0: Perceivable

- Provide text alternatives for non-text content.
- Provide captions and other alternatives for multimedia.
- Create content that can be presented in different ways, including by assistive technologies, without losing meaning.
- Make it easier for users to see and hear content.

http://www.w3.org/WAI/WCAG20/quickref/

WCAG 2.0: Operable

- Make all functionality available from a keyboard
- Give users enough time to read and use content
- Do not use content that causes seizures
- Help users navigate and find content

http://www.w3.org/WAI/WCAG20/quickref/

WCAG 2.0: Understandable

- Make text readable and understandable
- Make content appear and operate in predictable ways
- Help users avoid and correct mistakes

http://www.w3.org/WAI/WCAG20/quickref/

57

WCAG 2.0: Robust

- Maximize compatibility with current and future user tools

http://www.w3.org/WAI/WCAG20/quickref/

58

ACCESSIBILITY:
TESTING ACCESSIBILITY COMPLIANCE

Tools:

- **AChecker WCAG2 Online Validator:**
  http://achecker.ca/checker/index.php
  An open source Web accessibility evaluation tool.
  Can be used to review the accessibility of Web pages based on a variety of international web accessibility guidelines

- **Total Validator:** http://www.totalvalidator.com/index.html
  An accessibility validator, (as well as an (X)HTML validator, a spell checker, and a broken links checker etc.) allowing one-click validation of your website. *Can be added to Firefox and/or installed stand alone.*
- **Web Accessibility Checklist (v2)**
  Provides a useful suggestions for addressing WCAG 2.0 guidelines.

  https://www.wuhcag.com/wcag-checklist/

GETTING STARTED

Software Installation Option 1

- **Server Software**
  - **Web Server** (Apache) to host your webpage
    - University's web server, the URL is http://mercury.swin.edu.au
    - Personal web server (using XAMPP package) your URL will be http://localhost ***(Only if you want to install it)***
- **Client Software**
  - **Web Browser** (Mozilla Firefox, Google Chrome, etc)
  - **File Transfer** (WinSCP, CyberDuck, etc) to securely copy the webpage to the server
  - **Text Editor** (Notepad++, Sublime, etc) to edit the webpage code

Software Installation Option 2

- **IDE Software with Client and Server Preview Support**
  - **Brackets** is a free open-source editor written in HTML, CSS, and JavaScript with a primary focus on Web Development.
  - created by Adobe Systems, licensed under the MIT License
  - is available for cross-platform download on Mac, Windows, and Linux.
  - http://brackets.io/

WHAT'S NEXT?
– LAYOUT AND GRID SYSTEM