**An Introduction to WEB Engineering**

**Learning Objectives**
- Understand the characteristics of a good web site.
- Appreciate why Web projects fail.
- Consider whether software engineering principles can be applied to Web apps.
- Define and examine the phases of Web engineering.
- Appreciate the Umbrella activities associated with Web engineering.

**Recap**
- You have examined:
  - What e-commerce is;
  - How e-commerce impacts business models;
  - How to evaluate Web sites:
    - Context of use
    - Evaluation
      - Usability
      - Accessibility
      - Commercial suitability
    - Site Structure
    - Navigation
    - Page layout

**What Makes a Good Website?**
- We have looked at how to evaluate a web site.
- But what makes a good Web application?
- What do we mean by good?

**Quality Requirements**
( based on Pressman 2000 p.813-842)

- Usability: Global site understandability, Online feedback and help facilities, Interface features
- Functionality: Search and retrieval capability, Application domain features
- Reliability: Correct link processing, Error recovery, User input validation
- Efficiency: Response time performance, Page generation speed, Graphics generation speed
- Maintainability: Ease of diagnosis and correction, Redundancy

**E-commerce Characteristics**
- Rapid Expansion
- Advances in wireless technology delivering mobile Web applications
- Increasingly complex content and functionality
- Business increasingly dependent upon Web applications
### Web Applications

- **Web apps range from:**
  - Short term, small scale initiatives
  - Large scale Internet applications distributed across corporate intranets and extranets
- **Development**
  - Often ad hoc / hacker approach without:
    - Systematic techniques
    - Sound methodologies
    - Quality assurance

### Web Based Projects

A survey of Web based projects revealed:

- 84% did not meet business needs
- 79% suffered from schedule delays
- 63% exceeded budget
- 53% did not have required functionality
- 52% were regarded as 'poor quality'

### People Treat the Web Like Print

- I have this marketing literature; now make me a Web site!
- Make it look pretty first and then worry about the content later.
- Focusing too much on the visual leads to the dreaded online brochure in the form of full screen GIFs and JPEGs. Text as pictures and low color illustrations for fast download. But poor maintainability

### More Development Issues

- Focus on the content or technology first and then decorate:
  - This leads to the “Christmas Tree” design. A few red balls, a rainbow color bar, and an animated logo to spice up a page.
- Key Problems: Implementation first and balance between function and aesthetics. Make something visually appealing that works, but do so within the constraints of the Internet and Web technologies.

### More Development Issues

- Current: “If it looks right it must be right” attitude
- Little consideration of
  - Real world browser problems
  - Operating Systems
- When building sites that do something, many things can and often do go wrong. To try to minimize potential problems, use a rigorous methodology.
- Solution:
  - Application of Software Engineering principles to Web development

### What is Software Engineering

- IEEE Definition of Software Engineering:
  The application of a systematic, disciplined, quantifiable approach to the development, operation and maintenance of software; That is, the application of engineering to software.
- Software development often depicted as a life cycle model.
The Life-cycle Model

- Analysis
  - problem and requirements defined
- Design
  - Data structure, software architecture, interface and algorithmic detail.
- Implementation
  - coding and unit testing
- Testing
  - integration, system and acceptance testing
- Operation and Maintenance

?But?

- Is there a difference between S.E. and Web application development?
- Classic S.E. for information systems
  - Customer specifies requirements
  - System used by employees/experts
  - Internal, business process orientated
- What are the characteristics of Web application development?

Contrast S.E. and Web Development

- Shorter development and life cycles
- Changes business models
- Software failure = business failure
- 24x7 global exposure
- Unpredictable usage and traffic patterns
- Customers do not know how to specify requirements.

Web Apps. A Mixture of:

- Print publishing and Software development
- Marketing and Computing
- Internal communications and External relations
- Art and Technology

Attributes of Web-based Applications

- Web-based applications are:
  - Network intensive,
  - Content-driven,
  - In continuous evolution
  - Sensitive to:
    - Security issues
    - Scalability
    - Poor user interface design
- Complex constructions require a systematic approach.

Web Engineering

- Can be simply defined as "Software Engineering for the web."
- The development of software which will be used in a web or E-Commerce environment.
- Software Engineering principles and processes can generally be applied to Web Engineering.
- However, Some modifications and additional processes are required.
**Definition of Web Engineering**

- Is the establishment and use of sound scientific, engineering and management principles and disciplined and systematic approaches to the successful development, deployment and maintenance of high quality Web-based systems and applications.

**The life-cycle model**

- Requirements Analysis
- Design
- Implementation - coding
- Testing
- Support
- Maintenance

**Requirements Analysis**

- Discussions with the client
  - What is the purpose of the website?
  - Who will be accessing the website?
  - What is the expected outcome?
  - Agree timescales & testing criteria.
- Documentation
  - Requirements specification.
  - Functional Specification.
  - Test specification.

**Design**

- Design issues in detail
  - Content design
  - Navigational design
  - Interaction design
  - Interface design
- Prototyping
- Documentation
  - Design specification

**Critical Point**

- Before moving from Design to Implementation:
  - Ensure all the client's requirements are met.
  - Ensure the tools you are planning to use are appropriate.

**Implementation - coding**

- Development of the complete product.
- Use of appropriate development tools.
- Use of appropriate programming/scripting languages.
- Documentation
  - The deliverables here are the code and web pages themselves.
**Testing - Phase 1**

- Websites are generally developed locally on a client computer.
- Test that all content is correct. Equivalent to proof-reading a book.
- Test that all links work appropriately.
- Test scripts and code produce the desired behaviour.
- Checks should be made that the website performs correctly in target browsers.

**Testing - Phase 2**

- Transfer from the development environment (local client) to the destination environment.
- If possible still isolate from public access.
- Check that all links (local & external) function as expected.
- Check all scripts and code again for unforeseen problems.
- Check speed of access (particularly graphics).

**Testing - Phase 3**

- Acceptance Testing
  - Allow the client access to perform their own testing.
  - The client should formally test the software according to the agreed Test Specification.
  - When complete the project should be formally signed off.
  - At this point the website will be released for operational use.

**Support / Maintenance**

- The client may require further support and documentation / training.
- On-line documentation may be required.
- Maintenance will be required
  - Updating web content.
  - Regular checking of links to ensure they are still available.
  - Addition of new features.

**Umbrella Activities**

- Project management
- Software quality assurance
- Software configuration management

**Project Management**

- Planning and Scheduling
- Resource allocation
- Risk estimation
- Outsourcing issues
- Web team (content developers, publishers and engineers)
- Project control and managing scope
- SQA
- SCM
Quality Control

• Quality Assurance
  – design and monitoring of appropriate standards and procedures to achieve high quality outcomes from system development activities.
  – Testing is critical to QA
• Quality Control
  – conformance to this regime by all members of a system development team.

Quality Assurance Regime

• Quality manual sets out:
  – standards to be observed;
  – procedures to be followed;
  – quality control checks to be applied.
• Each development project will derive from this a specifically tailored quality plan and set of tests.

Software Configuration Management (SCM)

• Development
  – Ensure that all changes can be tracked and monitored.
  – Vital when teams of developers are working on a project.
  – Maintain quality.
• Post development
  – Maintain security
  – Avoid unauthorised content change
  – Maintain functionality as web site evolves.

Summary

• Web Engineering has similarities with Software Engineering.
• Many of the same design and testing processes can and should be applied.
• Many existing development & configuration tools can be applied to Web Engineering.
• Web Engineering is a new genre of system/software engineering

References