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Introduction to Web Engineering

Introduction

Web Engineering

Categories of Web Applications

Characteristics of Web Applications

Introduction to Web Engineering

September 21, 2010



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Outline

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- 1 Introduction
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Introduction

- A Web application is a software system based on technologies and standards of the World Wide Web Consortium (W3C) that provides Web specific resources such as content and services through a user interface, the Web browser.
- Main stream software application

Challenges

The following problems were identified for large-scale Web application projects (Cutter Consortium, 2000):

- Failure to meet business needs (84%)
- Project schedule delays (79%)
- Budget overrun (63%)
- Lack of functionality (53%)
- Poor quality of deliverables (52%)



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Web Engineering

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Characteristics of Web Applications

- An independent branch of software engineering

Software engineering is the application of science and mathematics by which the capabilities of computer equipment are made useful to man via computer programs, procedures, and associated documentation (Boehm, 1976).

- Web Engineering is the application of systematic and quantifiable approaches (concepts, methods, techniques, tools) to cost-effective requirements analysis, design, implementation, testing, operation, and maintenance of high-quality Web applications.
- It is also the scientific discipline concerned with the study of these approaches.



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Categories

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Categories of Web Applications

Characteristics of Web Applications

- Document centric Web sites
- Interactive Web
- Transactional Web applications
- Workflow-based Web applications
- Collaborative Web applications
- Social Web
- Portal-oriented Web applications
- Ubiquitous Web applications
- Semantic Web

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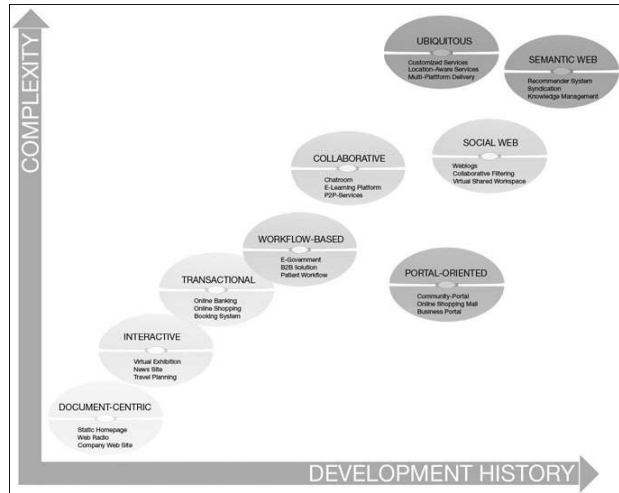


Figure: Categories of Web applications - a history



Document centric web sites

- These are static HTML documents present on a Web server
- Manual changes to the documents are required to update any information
- Danger of inconsistent and outdated information

Interactive and transactional Web

- Use of CGI(Common Gateway Interface) and HTML forms provided means of interaction
- Mostly read-only access to resources
- Database systems enabled the transaction-based Web applications



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Categories : Detail II

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Characteristics of Web Applications

- Transactional Web applications enabled to update and retrieve huge amount of data as well as a large number of users
- Examples include banking systems, airline ticketing systems etc.

Workflow-based Web applications

- Provided mechanisms to support workflows between various departments, organisations etc.
- Require a certain level of automation in the concerned business processes
- Examples include B2B in e-commerce, e-government in public sector administration



Collaborative and social networks

- Collaborative Web applications support diversified organisations with unstructured operations/processes
- High level of communications is required in such systems
- Requirements for shared workspaces and different levels of privileges for the users
- Examples include e-Learning systems, distributed brain-storming (board-room) systems, collaborative design systems, Weblogs
- Social networks provide a socialising facility to a targeted audience
- People with similar interests can interact with each other
- Myspace, Weblogs (blogs), etc.



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Categories : Detail IV

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Characteristics of Web Applications

Web portals

- A single point of access to multiple services in a particular domain or multiple domains
- Examples include Google, Yahoo, etc.
- Specialised Web portals are also popular, i.e., business portals, health-sector portals etc.

Explore Ubiquitous Web applications & Semantic Web



Characteristics of Web Applications

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Characteristics of Web Applications

Product characteristics Usage Related Characteristics

- Web applications differ from traditional applications in various ways
- Web applications have non-linear navigation and require frequent updates
- Four main categories of characteristics/features of a Web application:
 - Product related characteristics
 - Usage related characteristics
 - Development related characteristics
 - Evolution characteristics



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Product characteristics

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Product characteristics

Usage Related Characteristics

- Characteristics related to product (Web application, traditional software applications)
- Product related characteristics cover the main building blocks of Web applications
 - Cover three building blocks 1) content, 2) hypertext and 3) presentation
- Generation, presentation and update of content is the main output of Web applications
- Hypertext defines the navigational structure of the Web application
- Presentation deals with the user interface of the Web application



Content features - Product Characteristics

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Product characteristics

Usage Related Characteristics

- Besides the development of software component, developers are often required to create content for the Web applications
- Two aspects are important
 - **Document-centric character & multimedia** and **Quality Demands**
 - **Document-centric character and multimedia** refers to the fact that content is targeted to the needs of a particular user group.
 - Content is provided in the form of tables, text, graphics, audio & video
 - Multimedia content is also delivered through Web



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Content features ..

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Usage Related Characteristics

- **Quality demands** differ from various content types and the user groups.
 - General quality attributes may include frequency of updates, provision of relevant information and reliability of content.
 - For example, news sites need to be continuously updated.
 - Content has to be organised in the form of various topics.
 - Personalization of the content by a particular user helps him to focus on news of his interests
 - e-Commerce Web sites(online shopping) require updated information related to price and stock availability

What content attributes are important for a stock exchange Web site which allows online trading (buying and selling of shares)?



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Hypertext features – Product Characteristics

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Usage Related Characteristics

- Hypertextual documents as the main form of information presentation.
- Basic elements of hypertextual model are nodes, links and anchors.
- Hypertextual nature of Web applications has two important features:
 - **Non linearity** and **Disorientation and cognitive overload**

Non linearity

- Standard hypertext assumes a systematic reading behaviour of a user
- Hypertextual structure of Web applications is non-linear i.e., freedom of navigation in any order
- Hypertexts are pre-defined (static) or are generated dynamically
- Non-linear nature or freedom of movement introduce new problems of disorientation



Disorientation and cognitive overload

- Disorientation is to loose one's bearings in a non-linear document
- Cognitive overload is caused by the additional attention required to keep in mind several paths or tasks simultaneously
- Disorientation can be avoided by using site maps, keywords, searches, navigational history etc.
- Useful link names and meaningful linking reduces cognitive overload



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Presentation features - Product Characteristics

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Usage Related Characteristics

- Presentation deals with the user interface of a Web application
- Two main features can be related to the presentation
 - **Aesthetics** and **Self explanation**

Aesthetics

- Look and feel of Web application an important factor
- It is highly fashionable and trendy and often is one of the main factors in Web applications especially e-Commerce and entertainment portals

Self explanation

- Use Web application without documentation or a manual
- Consistent navigational structure helps users to use the application easily



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Usage Characteristics

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Usage Related Characteristics

- Usage of a Web application is extremely diversified
- Diversity lies in the users' background, platform/device being used and the frequency of usage
- Prediction and control of this contextual behaviour is difficult
- Web applications need to adapt to the changes in usage situations or *contexts*
- Three groups of usage-specific characteristics are identified
 - 1) Social context 2) technical context and 3) natural context



- Social context of the users i.e., multicultural and usage frequency introduces great level of heterogeneity

Spontaneity

- Frequency of a user's visit to a Web site is unpredictable
- Same is the case with loyalty, user may move to competitor's Web site
- Example, compare your favourite search engines (Google vs Yahoo) or email services
- Spontaneity introduces the issue of scalability i.e., no of users can not be predicted



Multiculturality

- Different user groups belong to different cultural backgrounds
- Customisation content is therefore, required to meet the needs of each group i.e., consider users' with certain disabilities
- A Web application targeting an International audience has to consider the time zone differences as well
- Customise the contents according to cultural norms
- Personalisation of content and presentation style is also required



- Defines the technical aspects i.e., network issues, hardware/software of the devices etc.
- The characteristics are **quality of service** and **multi-platform delivery**

Quality of Service

- network connection's bandwidth and reliability varies considerably
- In case of multimedia content, content delivery should be based on client's/user's available connection speed
- Mobile Web applications require more adaptation to the network characteristics at application level for example different handset capabilities, signal strength, connection mode (GPRS, 3G)



Multi-platform delivery

- Users have full control of their devices, and client applications (browsers)
- Browsers are customised by the users (caching, cookies, presentation layouts, security levels etc.)
- This customisation effects the performance, user interaction and transaction functionality



Natural context - Usage Characteristics

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Usage Related Characteristics

- Related with the location and time of access
- The characteristics are **globalisation** and **availability**

Globalisation

- The geographical location of the user
- Consider regional and cultural differences
- Requires increased security measures to impose restrictions on the access of certain features/information

Availability

- Web application is available for use immediately, so is the content
- Web application should be made online/live once quality attributes have been satisfied
- Requirement on stability of the Web application increases due to 24/7 operation and availability



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References & Self Study

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Product characteristics

Usage Related Characteristics

Lecture Notes & Reading Material

- 1 Chapter 1 of *“Web Engineering: The discipline of Systematics Development of Web Applications”*.

Self Study

- 1 Ubiquitous and Semantics Web
- 2 Development and Evolution characteristics
 - 1 Both from Chapter 1 (pp 14-17) of *“Web Engineering: The discipline of Systematics Development of Web Applications”*