

IF2261 Software Engineering

Web Engineering

Program Studi Teknik Informatika
STEI ITB



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WebApp Attributes

- Network intensive
- High concurrency
- Unpredictable user loads
- Performance (fast delivery)
- High availability
- Data driven
- Content sensitive
- Continuous evolution
- Immediacy
- Security
- Aesthetics

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WebE Application Categories

- Informational
 - read only content provided with simple navigation
- Downloads
 - user downloads information from server
- Customizable
 - user customizes content to specific needs
- Interaction
 - community of users communicate using chat rooms, bulletin boards, or instant messaging
- User input
 - users complete on-line forms to communicate need
- Transaction-oriented
 - user makes request fulfilled by WebApp - places an order

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WebE Application Categories (2)

- Service-oriented
 - application provides service to user
- Portal
 - application directs users to other web content or services
- Database access
 - user queries a large database and extracts information
- Data warehousing
 - user queries large collection of databases and extracts information

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WebApp Enabling Technologies

- Component-based development
 - CORBA,
 - COM/DCOM,
 - JavaBeans
- Security
 - encryption,
 - firewalls, etc.
- Internet standards
 - HTML,
 - XML,
 - SGML

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WebApp Development Process Characteristics

- WebApps are often delivered incrementally
- Changes occur frequently
- Timelines are short

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WebApp Process Framework

- Customer communication
- Planning
- Modeling
- Construction
- Delivery and evaluation

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WebE Task Set

- Customer Communication (Analysis/Formulation)
 - Identify business stakeholders
 - Formulate business context
 - Define key business goals and objectives
 - Define information and applicative goals
 - Identify the problem
 - Gather requirements
- WebE Planning
 - Define development strategy
 - Assess risks
 - Define development schedule
 - Establish metrics for content management and change control

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WebE Task Set

● WebE Modeling

- Define content classes
- Identify content relationships
- Define user tasks
- Identify computational functions
- Identify database requirements
- Define interface requirements
- Design the WebApp architecture
- Design the interface
- Design the navigational scheme
- Design appropriate security and privacy mechanisms
- Review the design

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WebE Task Set

● WebE Construction

- Build or acquire the content and integrate it into WebAPP architecture
- Establish navigational capabilities
- Implement computational functions
- Address configuration issues
- Test all WebApp components
- Address configuration issues
- Test all WebApp components (content and function)
- Test navigation
- Test usability
- Test security and performance
- Test increment for different configurations

● WebE Delivery and evaluation

- Deliver WebApp increment to representative end-users
- Evaluate end-user interaction
- Assess lessons-learned and consider all end-user feedback
- Make modifications to WebApp increment as required

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Web Engineering Best Practices

- Take time to understand the business needs and product objectives
- Describe how users will interact with the WebApp using a scenario-based approach
- Develop a brief project plan
- Spend time modeling what you are going to build.
- Review models for consistency and quality.
- Use tools and technology that enable you to construct the system with as many reusable components as possible.
- Don't rely on users to debug the WebApp, design comprehensive tests and execute them before releasing the system.

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WebE Team Members

- Content developers and providers
 - focus on generation and/or collection of WebApp content
- Web publisher
 - liaison between technical staff who engineers WebApp and non-technical content developers and providers
- Web engineer
 - involved with WebApp requirements elicitation, analysis modeling, architectural design, navigational design, interface design, implementation, and testing
- Business domain experts
 - focus on the specific business problems to be address by the WebApp
- Support specialist
 - responsible for continuing WebApp maintenance and support
- Administrator (Web master)
 - responsible for daily operation of WebApp

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WebApp Requirements Analysis Tasks

- Formulation
 - Identify goal and objectives for WebApp
 - Define categories of users and create user hierarchy
- Requirements Gathering
 - Communication between WebE team and stakeholders intensifies
 - Content and functional requirements are listed
 - Interaction scenarios (use-cases) are developed
- Analysis modeling
 - Content model
 - Interaction model
 - Functional model
 - Configuration model

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Requirement Analysis

- Identify the categories of the end-users who will interact with the WebApp
 - Often called actors
 - Develop a user hierarchy if it's necessary
- Develop use case model
 - Identify use cases
 - Describe each use cases
 - Draw a use case diagram
- Refine the Use Case Model

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Content Model

- Represent WebApp content requirements
 - WebApp content objects
 - text, graphics, photographs, video images, audio
- Includes all analysis classes
 - user visible entities created or manipulated as end-users interact with WebApp
- Analysis classes defined by class diagrams showing attributes, operations, and class collaborations
- Derived from examination of WebApp use-cases
- Entity-relationship diagrams may be part of the content model

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Interaction Model

- Use-cases
 - dominant element of WebApp interaction models
- Sequence diagrams
 - provide representation of manner in which user actions collaborate with analysis classes
- State diagrams
 - indicates information required to move users between states and represents behavioral information, can also depict potential navigation pathways
- User interface prototype
 - layout of content presentation, interaction mechanisms, and overall aesthetic of user interface

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Functional Model

- User observable behavior delivered to end-users
- Operations contained in analysis classes to implement class behaviors
- UML activity diagrams used to model both

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Configuration Model

- May be a list of server-side and client-side attributes for the WebApp
- UML deployment diagrams can be used for complex configuration architectures

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WebApp Design Goals

- Simplicity
- Consistency
- Identity
- Robustness
- Navigability
- Visual appeal
- Compatibility

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Web Engineering Design Activities

- Interface design
 - describes structure and organization of the user interface (screen layout, interaction modes, and navigation mechanisms)
- Aesthetic design
 - look and feel of WebApp (graphic design)
- Content design
 - defines layout, structure, and outline for all WebApp content and content object relationships
- Navigation design
 - navigational flow between content objects
- Architectural design
 - hypermedia structure of WebApp
- Component design
 - develops processing logic required to implement the WebApp functional components

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End-User Interface Concerns

- Where am I?
 - Interface should indicate which WebApp is running
 - Interface should indicate user's location in content hierarchy
- What can I do now?
 - Interface helps user understand current options (live link and relevant content)
- Where have I been and where am I going?
 - Provide user with map showing paths through the WebApp

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Pragmatic WebApp Interface Guidelines

- Reading speed on monitor is about 25% slower than for hardcopy
- Avoid "under construction" signs
- Users prefer not having to scroll to read content
- Navigation menus and headers should be designed consistently and be available on all pages available to the user
- Do not rely on browser functions to assist in navigation
- Aesthetics should never take precedence over application functionality
- Navigation should be obvious to casual users

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Interface Control Mechanisms

- Navigation menus
- Graphic icons (buttons, switches, etc.)
- Graphic images (used to implement links)

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Interface Workflow Tasks

1. Review and refine analysis information.
2. Develop rough sketch of WebApp interface layout.
3. Map user objectives into specific interface actions.
4. Define set of user tasks associated with each action.
5. Storyboard screen images for each interface action.
6. Refine interface layouts and storyboards using input from aesthetic design.
7. Identify user interface objects required to implement user interface.
8. Develop procedural representation of user's interaction with the interface.
9. Develop a behavioral representation of user's interaction with the interface.
10. Describe interface layout for each state.
11. Review and refine the interface model (focus on usability).

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Aesthetic Design

● Layout issues

- Use white space generously
- Emphasize content
- Organize elements from top-left to bottom-right
- Group navigation, content, and function geographically within page
- Avoid temptation to use scroll bars
- Take differing resolutions and browser window sizes into account during design

● Graphic design issues

- Layout
- Color schemes
- Text fonts, sizes, and styles
- Use of multimedia elements (audio, video, animation, etc.)

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Content Design

● Representations for content objects and their relationships (Web engineers)

- Analysis content objects modeled by UML associations and aggregations

● Representation of information within specific content objects (content authors)

- As content objects are designed they are "chunked" to form pages (based in user needs and content relationships)
- Aesthetic design may be applied to get the proper look and feel for the information

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Architecture Design

- Content architecture
 - focuses on the manner in which content objects are structured for presentation and navigation
- WebApp architecture
 - addresses the manner in which the application is structured to manage user interaction, handle internal processing tasks, effect navigation, and present content (may be influenced by the nature of the development environment)
- Architectural design is often conducted in parallel with user interface design

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Model-View-Controller (MVC) Architecture

- Three layer architecture that decouples interface from both navigation and application behavior
 - Model object - contains all application specific content and processing logic
 - View - contains all interface specific functions enabling presentation of content and processing logic
 - Controller - manages access to the model and the views and coordinates flow of data between them
- In WebApps, the view is updated by the controller using data from the model based on user input

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Navigation Design

- Identify the semantics of navigation for different users based on the perceived roles (i.e., visitor, registered customer, or privileged user) and the goals associated with their roles.
- Define the mechanics (syntax) of achieving navigation

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Navigation Syntax

- Individual navigation link
 - text-based links, icon, buttons, switches, and geographical metaphors
- Horizontal navigation bar
 - lists 4 to 7 major content or functional categories in a bar with appropriate links
- Vertical navigation column
 - Lists major content or functional categories
 - Lists virtually all major content objects in WebApp
- Tabs
 - variation of navigation bar or columns
- Site map
 - provides all inclusive table of contents to all content objects and functionality contained in the WebApp

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Use WebApp Design Metrics

- Is the WebApp interface usable?
- Are the aesthetics of the WebApp pleasing to the user and appropriate for the information domain?
- Is the content designed to impart the most information for the least amount of effort?
- Is navigation efficient and straightforward?
- Has the WebApp architecture been designed to accommodate special goals and objectives of users, content structure, functionality, and effective navigation flow?
- Are the WebApp components designed to reduce procedural complexity and enhance correctness, reliability, and performance?

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