

# **An Introduction to Web Engineering**

Week 1

# Syllabus

- <http://www.csun.edu/~twang/595WEB/Syllabus>

# Introduction Session

- Introduce yourself
  - Name, majors, expertise, experiences, keywords related to web engineering.

# Software Project Success Rate

Data on 280,000 projects completed in 2000 - *Standish Group Data*



<http://www.softwagemag.com/archive/2001feb/CollaborativeMgt.html>

# Definition of Software Engineering

- *Software Engineering is defined as 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.*

# A Survey by the Cutter Consortium

- The top problem areas of large-scale Web application projects
  - Failure to meet business needs (84%)
  - Project schedule delays (79%)
  - Budget overrun (63%)
  - Lack of functionalities (53%)
  - Poor quality of deliverables (52%)

# Definition of Web Engineering

- *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.*

# Chapter 1: Web-Based Systems

- In the early days of the Web, we built systems using **informality, urgency, intuition, and art**
  - *Informality* leads to an easy work environment—one in which you can do your own thing.
  - *Urgency* leads to action and rapid decision making.
  - *Intuition* is an intangible quality that enables you to “feel” your way through complex situations.
  - *Art* leads to aesthetic form and function—to something that pleases those who encounter it.
- Problem is—**this approach can and often does lead to problems**



# The Web

- An indispensable technology
  - In virtually every aspect of modern living
- A transformative technology
  - Changes the way we do things
  - Changes the way we acquire and disseminate information
- An evolving technology
- Bottom line—high impact on everyone in the modern world

# WebApps

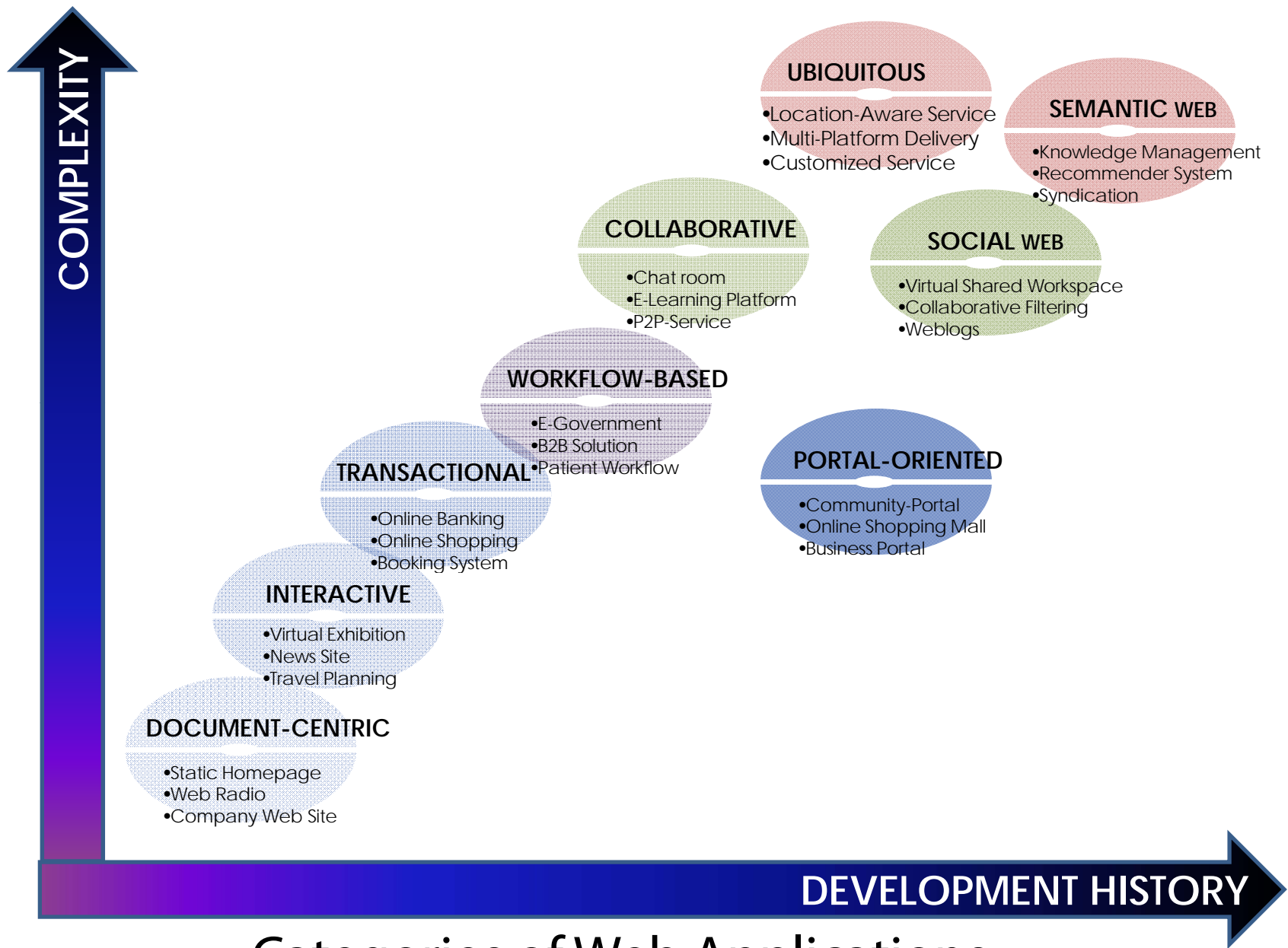
- The term *Web application (WebApp)* encompasses:
  - everything from a simple Web page that might help a consumer compute an automobile lease payment to a comprehensive website that provides complete travel services for business people and vacationers.
  - Included within this category are complete websites, specialized functionality within websites, and information-processing applications that reside on the Internet or on an Intranet or Extranet.

# WebApp Attributes

- Network intensiveness
- Content sensitive
- Concurrency
- Continuous evolution
- Unpredictable load
- Immediacy
- Performance
- Security
- Availability
- Aesthetics
- Data driven

# WebApp Types

- Informational
- Download
- Customizable
- Interaction
- User input
- Transaction-oriented
- Service-oriented
- Portals
- Database access
- Data warehousing



Categories of Web Applications

# Why Web Engineering?

- As WebApps become larger and more complex,
  - Informality remains, but some degree of requirements gathering and planning are necessary
  - Urgency remains, but it must be tempered by a recognition that decisions may have broad consequences
  - Intuition remains, but it must be augmented by proven management and technical patterns
  - Art remains, but it must be complemented with solid design
- Bottom line:
  - we must adapt the old-school approach to the realities of a Web 2.0 world

# Chapter 2: *Web Engineering*

- We define it this way:
  - *an agile, yet disciplined framework for building industry-quality WebApps.*
- We must understand the meaning of:
  - Agile
  - Disciplined framework
  - Industry quality

# Why Agility?

- Business strategies and rules change rapidly
- Management demands near-instantaneous responsiveness (even when such demands are completely unreasonable)
- Stakeholders often don't understand the consequences of the Web and keep changing their mind even as they demand rapid delivery
- An agile approach helps cope with this fluidity and uncertainty.



# What is an Agile Process?

- Agile Web engineering combines a philosophy and a set of development guidelines. The philosophy encourages:
  - customer satisfaction
  - early incremental delivery of the WebApp
  - small, highly motivated project teams
  - informal methods
  - minimal work products
  - overall development simplicity.

# What is an Agile Process? (cont'd)

- An agile process stresses delivery over analysis and design (although these activities are not discouraged), and active and continuous communication between developers and customers.
- <http://agilemanifesto.org/>

# Underlying Agility Principles - I

- Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
- Welcome changing requirements, even late in development. Agile processes harness continuous change for the customer's competitive advantage.
- Deliver working software increments frequently, from as often as every few days to every few months, with a preference to the shorter timescales.
- Business people and developers must work together daily throughout the project.
- Build projects around motivated people. Give them the environment and support they need, and trust them to get the job done. The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.

# Underlying Agility Principles - II

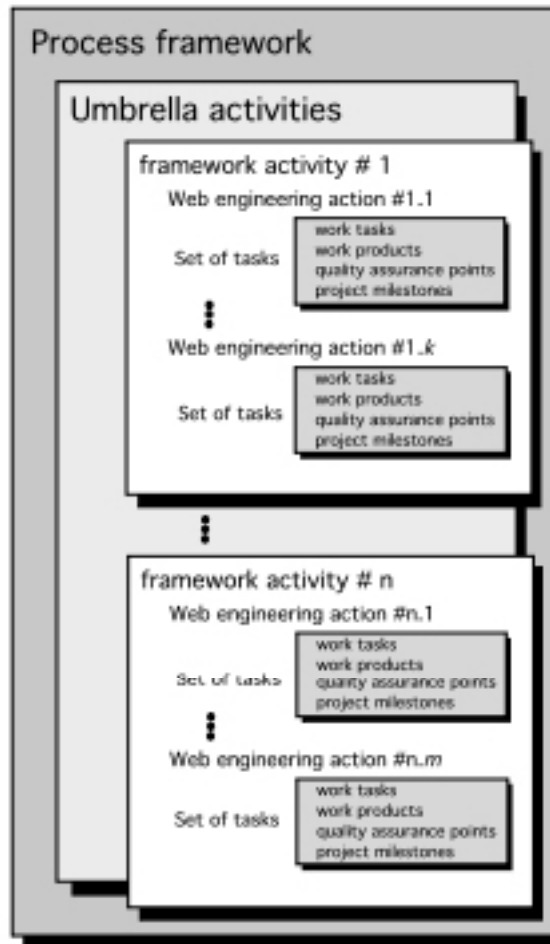
- Working software is the primary measure of progress.
- Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
- Continuous attention to technical excellence and good design enhances agility.
- Simplicity—the art of maximizing the amount of work not done—is essential.
- The best architectures, requirements, and designs emerge from self-organizing teams.
- At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

# What is a WebE Framework?

- A framework is a set of activities that will *always* be performed for *every* Web engineering project – though the nature of the activities might vary to suit the project.
- Each framework activity is composed of a set of actions
- Actions encompass
  - work tasks
  - work products
  - quality assurance points, and
  - project milestones
- A framework also has a set of “umbrella activities”

# A Generic Framework

WebE process



# The WebE Framework: Activities

- **Communication.** Involves heavy interaction and collaboration with the customer (and other stakeholders) and encompasses requirements gathering and other related activities.
- **Planning.** Establishes an incremental plan for the WebE work.
- **Modeling.** Encompasses the creation of models that assist the developer and the customer to better understand WebApp requirements and the design
- **Construction.** Combines both the generation of HTML, XML, Java, and similar code with testing that is required to uncover errors in the code.
- **Deployment.** Delivers a WebApp increment to the customer who evaluates it and provides feedback based on the evaluation.

# Adapting the Framework

- Adapt to the problem, to the project, to the team, and to the organizational culture
  - And continue to adapt throughout the project as circumstances change!
- Adaptation leads to:
  - Overall flow of activities, actions, and tasks and the interdependencies among them
  - Degree to which work tasks are defined within each framework activity
  - Degree to which work products are identified and required
  - Manner in which quality assurance activities are applied
  - Manner in which project tracking and control activities are applied
  - Overall degree of detail and rigor with which the process is described
  - Degree to which customers and other stakeholders are involved with the project
  - Level of autonomy given to the software project team
  - Degree to which team organization and roles are prescribed



# The Influence of Software Engineering



- Quality: foster a continuous process improvement culture
- Process: the glue that holds the technology layers together
- Methods: provide the technical how-to's
- Tools: support for the process and the methods

# WebE Methods

- Communication methods
- Requirements analysis methods
- Design methods
- Construction methods
- Testing methods

# What about Tools and Technology?

*... tools and technology are very important, but they'll work well only if they're used within the context of an agile framework for Web engineering and in conjunction with proven methods for understanding the problem, designing a solution, and testing it thoroughly.*

# WebE Best Practices

- Take the time to understand business needs and product objectives, even if the details of the WebApp are vague.
- Describe how users will interact with the WebApp using a scenario-based approach.
- Always develop a project plan, even if it's very brief.
- Spend some time modeling what it is that you're going to build.
- Review the 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 reinvent when you can reuse.
- Don't rely on early users to debug the WebApp—design and use comprehensive tests before releasing the system.

# Lab Activities

- Organize a team.
- Note that each team consists of four /five students.
- Submit team information including student names, student IDs, and email addresses.

# **(Team) Homework Assignment 1**

- Study assigned (Web 1.0 and) Web 2.0 patterns (see the next slides for assignment) and prepare for presentation slides.
- Presentation slides should include, description, case study, and visual representation (figure) of each pattern.
- Due date is 7:00 pm, January 31<sup>st</sup>

# **(Team) Homework Assignment 1(cont'd)**

Team 1	SOA, SaaS
Team 2	Participation-Collaboration, Asynchronous Particle Update
Team 3	Mashup, RUE, Structured Information
Team 4	The Synchronized Web, Collaborative Tagging
Team 5	Declarative Living and Tag Gardening, Semantic Web

# **(Team) Homework Assignment 2**

- Study Web Engineering Processes (Ch. 3 or related materials) and prepare for presentation slides.
- Presentation slides should include, all activities and tasks for developing you group projects.
- Due date is 7:00 pm, January 31<sup>st</sup>