Development of Web-Based Courses: A Software Engineering Approach

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Motivation

• There are many software tools for creating web-based courses
  – E.g., CourseInfo and WebCT
• But there are very few methods that explain how to create a high quality and effective web-based course
• Using a tool must be preceded by more important activities, such as:
  – The analysis of instructional requirements
  – The design of the content, structure, interaction, and interface of the course
Research objectives

• To demonstrate that Software Engineering could be successfully applied to the development of web-based courses.

• This hypothesis was proven by:
  – building a software engineering based method for developing web-based courses
  – using the method to create several web-based courses
Research methodology

• An integration process was applied to design the method

• We integrated principles, models, and methods from:
  – Instructional System Design
  – Hypermedia
  – Object-Oriented Software Engineering

• A conceptual model of web-based courses was created first
  – It provided a conceptual framework for designing the method
Web-based courses: a definition

- A web-based course is an online course that applies the WWW technology to facilitate a teaching-learning process

- Key features:
  - Provides content, information, and directions through web pages
  - Facilitates three forms of interaction:
    - student-instructor
    - student-content
    - student-student
  - Provides access to collaborative tools for facilitating the interaction
    - E.g., E-mail, videoconference, discussion lists, chat, electronic whiteboards, etc.
A conceptual model of a web-based course

Web-based Course

Actors

Web Course Site

Interaction Tools

Web-based Study Guide

Authoring & Management Tool

1..n

is_composed_by

1

interact_through

2..n

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A conceptual model of a web-based course

Web-based Study Guide

- Course Information
  - Course Identification
  - Course Outline
  - Course Objectives
  - Course Schedule

- Actor Information

- Content Units
  - Unit Objectives
  - Topics to be covered
  - Learning Activities
  - Assessments
  - Online course material

- Evaluation & Study Techniques

- Bibliography & External Links
A method for developing web-based courses

Phases of the Method

- Domain Analysis
- Requirements Definition
- Verification & Validation
- Web-Based Study Guide Design
- Web-Based Study Guide Production
- Web-Based Study Guide Delivery

- Domain Analysis

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- Requirements Definition

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Domain Analysis Phase

- Analysis of content variables
- Analysis of student variables
- Analysis of instructor variables
- Analysis of the learning environment
Requirements Definition Phase

- Specify learning requirements
- Specify interaction requirements
- Specify user interface requirements
- Specify content requirements
- Specify operational requirements
- Verify requirements
Study Guide Design Phase

- Design the web study guide structure
- Define course description
- Define authors information
- Design content units
- Define evaluation and study techniques
- Define bibliography
- Design web pages
- Create course site
- Build study guide prototype
- Validate and verify design
Production Phase

- Produce textual content
- Produce graphical content
- Produce video content
- Produce audio content
- Produce image content

Assemble items into the prototype

Validate and verify the study guide
Testing the method

The method was tested by developing three web-based courses:

- A distance learning course in Software Engineering
  
  - www.centauro.ing.ula.ve/isoo

- A campus-based course on Software Engineering
  
  - www.csee.usf.edu/montilva/cen4020-002/cen4020.html

- A campus-based course on Software Design Methods
  
  - www.csee.usf.edu/montilva/cis4930/cis4930.html
Conclusions

• The method provides a well-structured and detailed guide to develop web-based courses
  – It helps the course developers to organize, plan and control the development process
  – It covers all the activities involved in the development process:
    • analysis, specification, design, production and delivery of a web-based course.

• The method contributes significantly to increase the quality and effectiveness of web-based courses
Development of Web-Based Courses

Thanks for your attention
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