Applying Scrum to Manage a Senior Capstone Project

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Indiana University – Purdue University Fort Wayne
CS Senior Capstone Project

- Two consecutive semesters
  - CS460 (Senior Capstone Project I) in Fall
  - CS465 (Senior Capstone Project II) in Spring
  - Collecting requirements in Summer
  - From Summer 2015 to Spring 2016

- Sponsor

![Allen County Public Library](logo) ![Audio Reading Service](logo)
Our Senior Capstone Project

- Design a Web application for ACPL
  - Collect the information of library users
  - Assign audio radios to them

- Users with disabilities
  - Difficult to hold a book or turn pages
    - Stroke, Parkinson’s, and arthritis
  - Unable to read conventional printed materials
    - Blindness, low-vision, or a literacy issue
System Structure of Our Web Application
Main Challenges

- **Ease of use**
  - Accessible to people with visual or reading impairment
- **Eliminating errors**
  - Will not be continued by other students in the future
- **IEEE standards education grant**
  - Americans with Disabilities Act (ADA) compliance standards
Issues with Traditional Project Management Method

- Waterfall approach
  - Misalignment between the software project and customers’ requirements
  - Late or delay development of the project
  - Uneven distribution of workloads
Related Work

- Reichlmayr reported on the experiences of conducting a team project in an introductory software engineering course using Agile development techniques [1].

- Fox and Patterson used Rails, a highly productive programming framework, to introduce Agile processes in their software engineering courses [2].

- Mahnic described the observations of the behavior of developers using Scrum for the first time in a capstone course in [3].
Different from Previous Works

- Work with real customers
- Produce a final product in public use
- Emphasize the importance of applying online tools
  - Pivotal Tracker
  - GitHub
Outline

- Scrum Overview
- Applying Scrum to Our Senior Capstone Project
- Evaluation and Outcomes of Our Senior Capstone Project
Scrum

- An Agile approach
- Manifesto for Agile software development
  - Individuals and interactions over processes and tools
  - Working software over comprehensive documentation
  - Customer collaboration over contract negotiation
  - Responding to change over following a plan
- Scrum is a widely adopted industry standard for building business software
Outline

- Scrum Overview
- Applying Scrum to Our Senior Capstone Project
- Evaluation and Outcomes of Our Senior Capstone Project
Three Principles from Scrum

- Working closely with customers
- Incremental development
- Weekly Scrum
Working closely with customers

- Monthly meetings with ACPL
  - Review what we had built
  - Provide us timely feedback

Avoid the issue of the misalignment between the software project and customers’ requirements!
Incremental development

- Implement an increment every month
- Implement the most important items first

Avoid the issue of the late or delayed development of the project!
Pivotal Tracker System
GitHub Repository

ACPL project using the Zend framework

- 284 commits
- 1 branch
- 0 releases
- 3 contributors

brewdd02 committed on GitHub Update RadioApplicationForm.php
- 7 months ago

docs
- Add files via upload
- 9 months ago

nbproject
- Adding initial version of modified project using the Zend framework
- a year ago

public
- Update admin.js
- 8 months ago

tests
- Added current tests for populating a data table with ajax and some of...
- a year ago

README.md
- Initial commit
- a year ago

acplZend

ACPL project using the Zend framework
Weekly Scrum

- Answers to three questions
  - What did I accomplish since the last weekly Scrum?
  - What do I plan to work on by the next weekly Scrum?
  - What are the obstacles or impediments that are preventing me from making progress?

Avoid the issue of the uneven distribution of workloads among students!
Outline

- Scrum Overview
- Applying Scrum to Our Senior Capstone Project
- Evaluation and Outcomes of Our Senior Capstone Project
Evaluation and Outcomes

- Web service provided to ACPL
- Response from ACPL customers
- Response from students
Web service provided to ACPL

- https://arsdatabase.acpl.lib.in.us/RadiosApplication/application/login/loginLoginForm.php
Online Application Forms

APPLICATION FOR AUDIO READING SERVICE RADIO

Allen County Public Library * Audio Reading Service
7615 DiSalle Blvd * Fort Wayne IN 46825 * 260.421.1376
audioreader@acpl.info

Fields marked with * are required

<table>
<thead>
<tr>
<th>Listener</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Name *</td>
<td>Last Name *</td>
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<tbody>
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<td>Street Address *</td>
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</table>

<table>
<thead>
<tr>
<th>City *</th>
<th>State *</th>
<th>Zip *</th>
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Admin Interface

Audio Reading Service
A department of the Allen County Public Library

Notifications

- Unread alert - Organization Application
  IPFW has applied for radios on 2016-04-29
    - View Details
    - Dismiss

- Unread alert - Organization Application
  temp has applied for radios on 2016-04-29
    - View Details
    - Dismiss
Response from ACPL Customers

Newsletter of ACPL

“A new, efficient listener and radio inventory database with a streamlined online application. This was made possible because of a collaboration with IPFW’s Computer Science department; three students created this for us as their Senior Capstone project.”

Email from ACPL managers

“We very much appreciated your help and the work that your students put into their project. It has helped our organization of listeners immensely.”
ACPL Volunteer Recognition Celebration

“WHAT YOU DO IS AWESOME!”

Audio
RECOGNITION CELEBRATION

Join us!

Thursday, June 9, 2016 - 12 noon-1:30 pm for Lunch and Recognition

The Towne House Retirement Center
2209 St. Joe Center Road - Fort Wayne

Seating begins at 11:40 pm - Lunch is served at 12:05 pm
Volunteers may attend with a guest

Limited seating - Please RSVP on or before June 1st by:

Phone: (260) 421-1376
Email: abryan@acpl.info
Mail: Return enclosed card

Parking is around back. Enter through Door 6 in the back and turn right in the hallway. A map of the campus is enclosed.

Allen County Public Library
## Response from Students

### CS 465 (Spring 2016)

<table>
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<tr>
<th>#</th>
<th>Question</th>
<th>Individual Evaluation</th>
<th>Department Evaluation</th>
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<td>7</td>
<td>Instructor’s knowledge of subject</td>
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<td>8</td>
<td>Instructor’s ability to present</td>
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<td>9</td>
<td>Instructor’s enthusiasm</td>
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<td>10</td>
<td>Instructor’s concern individual</td>
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<td>The class content</td>
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<td>Assignment related to course</td>
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<td>16</td>
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<td>Average of statements 7-12 &amp; 15-17</td>
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### CS 460 (Fall 2015)

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### Section: 23163 - Senior Capstone Project II  CS 46500-07

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<th>Agree (4)</th>
<th>Neither Agree nor Disagree (3)</th>
<th>Disagree (2)</th>
<th>Strongly Disagree (1)</th>
<th>Average</th>
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<td>I am able to apply software engineering principles and skills to a team-oriented software project.</td>
<td>abcdik</td>
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<tr>
<td>I am able to construct a software project schedule and track its progress.</td>
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<td>I am able to construct artifacts appropriate to demonstrate completion of each phase of the software process.</td>
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<td>2</td>
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<td>4</td>
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Conclusions

- Scrum method contributed significantly to the success of our senior capstone project.
- We overcame several challenges faced by the traditional waterfall approach.
- We believe that Scrum serves as a better project management method than waterfall for undergraduate senior capstone projects in computer science.
References


Thanks for your attention