


Seeds of Evidence:
Integrating Evidence-Based
Software Engineering
(or “What I did in my first grad course last fall”)

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The Pennsylvania State University, Altoona

SE Goals (among others)

- Industry's Goal:
 - Apply the most *efficient* (fastest or least costly) method/tool to produce, maintain, and evolve software that satisfies requirements with the fewest defects and best maintainability/reusability
- Academia's Goal:
 - Apply the most effective method/tool to convert novice freshmen into industry-ready professionals who can achieve Industry's Goal
- Research's Goal:
 - Discover/innovate methods and tools for meeting Industry's and Academia's Goals, and *demonstrate their efficacy*  **In other words, Prove it!**

EBSE

- Evidence-based/empirical software engineering uses tools like controlled experiments and case studies to answer questions like:
 - What is the “better” way to do software engineering in a given context?
 - PSP/TSP, Scrum, RUP, or XP
 - Solo programming + inspections or pair programming
 - J2EE, .NET, or Ruby on Rails



Challenge to SE Educators

- How to:
 - raise awareness of EBSE among students and industry practitioners
 - improve student skills in finding and critically reviewing EBSE studies
 - do above without adding a course to the curriculum
- My Opportunity:
 - CSC508 Software Engineering I

Context

- Cal Poly, San Luis Obispo
 - About 18,000 students
 - “Learn-by-doing” motto
 - Strong industry connections

CS Dept.	CS	SE	CPE
Undergrad	510	50	450
Graduate/4+1	40		

- Quarter system
- CSC508 is first of two SE grad courses
- My first time to teach a grad course

Course Goals

- Topics: Requirements Engineering, Project Management, Formal/Semi-formal methods

Project: Requirements with Prototype

Write a publishable paper

Develop EBSE awareness

Learn to find, read, and analyze scholarly SE papers

Engage “Net” generation

Approach

- Develop and populate a community-driven web database containing summaries of EBSE studies
 - SEEDS: SE Evidence Database System
- In teams of 4, students wrote requirements specifications and implemented horizontal and vertical prototypes of the system
- Individually students found and wrote summaries for 17 EBSE studies on a topic of their choosing

it2/userstories - 2007 Cal Poly CSC508 Team: Puma - Trac - Mozilla Firefox

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http://wiki.csc.calpoly.edu/puma/wiki/it2/userstories

Getting Started SurveyMonkey.com - ... Latest Headlines Morro Bay Dining - Re... The Keith Byrd Team'...

Roadmap - Tournament Bracket Mana... CSC 307 Schedule it2/userstories - 2007 Cal Poly C...

Wiki Browse Source

Start Page Index by Title Index by Date Last Change

User Stories

All papers will now be known as publications.
Topics will now be known as categories.

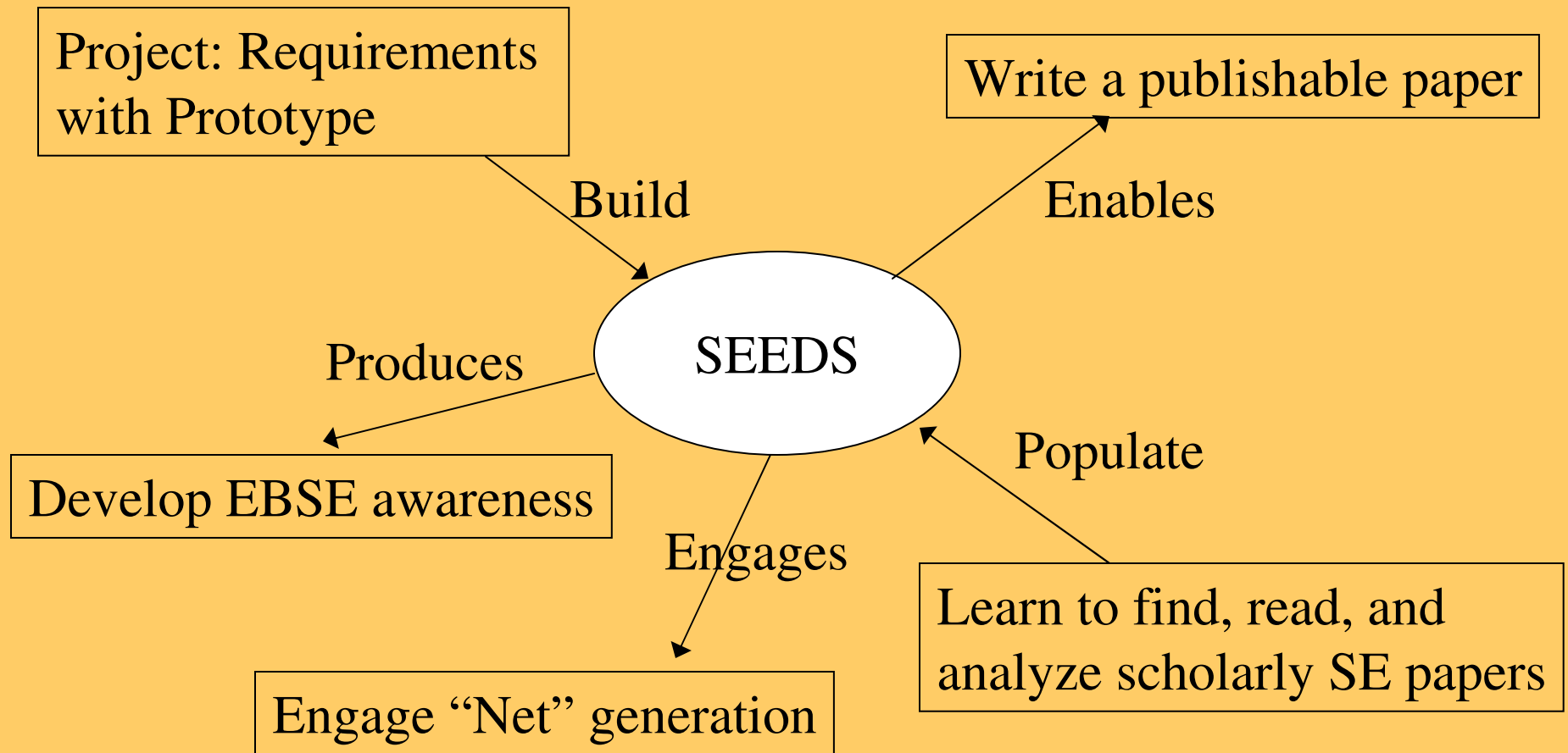
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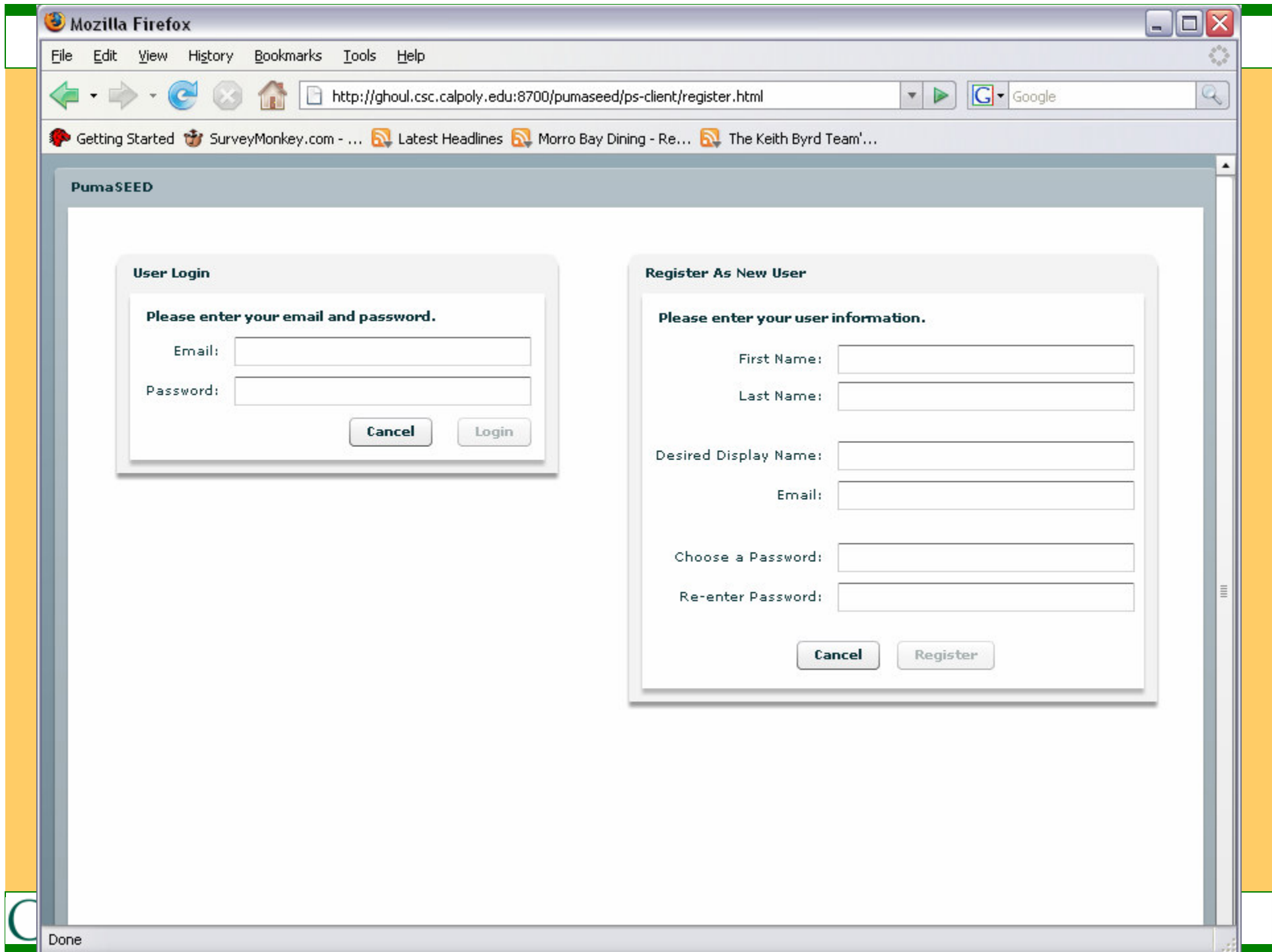
Priority
1. US-2

Done

Highest rated summaries bubble to top;
think urbandictionary.com or amazon.com

Accomplishing Goals Synergistically





Mozilla Firefox

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http://ghoul.csc.calpoly.edu:8700/pumaseed/ps-client/register.html

Google

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PumaSEED

User Login

Please enter your email and password.

Email:

Password:

Cancel

Login

Register As New User

Please enter your user information.

First Name:

Last Name:

Desired Display Name:

Email:

Choose a Password:

Re-enter Password:

Cancel

Register

Done

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Search

Browse "Category"

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"Category" Name: Test Driven Development

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|--|---|
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| <p>"Title": "Title of Publication"</p> <p>"Author(s)": Smith and Johnson</p> <p>"Publication Data": 2007</p> | <p>Rating: ★★★★★</p> <p>View ></p> |
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View "Publication"

Add Summary

Reviewer: JavaRockStar Positive Summary Rating: 54/88

Overall Rating: 9 Quality Rating: 10 Significance Rating: 8 [View >](#)

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"PumaSEED"

Add "Publication" Summary

"Publication" Title: Using Test Driven Development to Stay on Schedule

Author(s): John Doe and Frank Smith

Add Summary:

[Empty text area for adding a summary]

Poor -----> Excellent

Overall Rating: ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

Quality Rating: ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

Firefox browser window titled "Add a Summary - Mozilla Firefox". The address bar shows the URL: `http://users.csc.calpoly.edu/~dranders/508/horizontal/site/add_summary.html`. The browser has several tabs open, including "Add a Summary".

Add a Summary

Add a Summary

Topic

<input type="checkbox"/> Code Refactorization Methods	<input type="checkbox"/> Extreme Programming	<input type="checkbox"/> Metrics
<input type="checkbox"/> Paired Programming	<input type="checkbox"/> PSP	<input type="checkbox"/> SCRUM
<input type="checkbox"/> Static Analysis	<input type="checkbox"/> Test-First Procedures	<input type="checkbox"/> Waterfall Process

Reference

Summary

Done

Browse References - Mozilla Firefox

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Pair Programming


[How To](#)
View the [Comparison Grid](#) for Pair Programming.

[Pair Programming in an Introductory Computer Science Course: Initial Results and Recommendations](#)

Williams, L., Yang, K., Wiebe, E., Ferzli, M., Miller, C. 11/2002  4.4 (12 users)


Prior research indicates that pair programming, whereby two programmers work collaboratively on the same design, algorithm, code, or test, produces higher quality code in essentially half the time...

[Pair Programming in an Introductory Computer Science Course: Initial Results and Recommendations 2](#)

Williams, L., Yang, K., Wiebe, E., Ferzli, M., Miller, C. 11/2002  4.3 (12 users)

Prior research indicates that pair programming, whereby two programmers work collaboratively on the same design, algorithm, code, or test, produces higher quality code in essentially half the time...

[Pair Programming in an Introductory Computer Science Course: Initial Results and Recommendations 3](#)

Williams, L., Yang, K., Wiebe, E., Ferzli, M., Miller, C. 11/2002  4.1 (12 users)

Prior research indicates that pair programming, whereby two programmers work collaboratively on the same design, algorithm, code, or test, produces higher quality code in essentially half the time...

Topics

- [Xtreme Programming](#)
- [Pair Programming](#)
- [Static Code Analysis Tools](#)
- ...

http://users.csc.calpoly.edu/~dranders/508/horizontal/site/compare_papers.html

Comparison Grid

	Title	<input checked="" type="checkbox"/> Type of Experiment	<input checked="" type="checkbox"/> Size	<input checked="" type="checkbox"/> Class Level	<input checked="" type="checkbox"/> Student Sub-Type	<input checked="" type="checkbox"/> Selection Method	<input checked="" type="checkbox"/> Data Collection Method
<input checked="" type="checkbox"/>	But, isn't that cheating?	Case Study	20	Junior/Senior	N/A	Signed up for Pair Programming Course	Survey @ end of course
<input checked="" type="checkbox"/>	On the Impact of a Collaborative Pedagogy on African-American Millennial Students in Software Engineering	Case Study	11	3rd & 4th Year	African-American, born > 1982	Theoretical Sampling	Semi-structured interviews
<input checked="" type="checkbox"/>	Voices of women in a software engineering course: reflections on collaboration	Case Study	3	3rd & 4th Year	Female	?	Semi-structured interviews, 2 pg project retrospective.
...
	Edit the Table:	Delete	Delete	Delete	Delete	Delete	Delete
	Insert After	Insert After	Insert After	Insert After	Insert After	Insert After	Insert After



[Select All Papers](#) - [Select No Papers](#) - [Select All Attributes](#) - [Select No Attributes](#)

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Papers not shown:

- [Changing Students' Perceptions: An Analysis of the Supplementary Benefits of Collaborative Software Development](#)
- ...

Showing Off

- Because of time constraints, students needed to populate SEEDS before their prototypes were complete
- What to do?
- Used Drupal (content management system)
- Contained most of the desired features
- Took me two hours 
- Students were devastated 

SEED: Software Engineering Evidence Database

Topic

- [Coupling Metrics](#) (17)
- [Design Patterns](#) (17)
- [Pair Programming](#) (17)
- [PSP](#) (17)
- [Scrum](#) (33)
- [Static Analysis](#) (17)
- [TDD](#) (33)
- [Testing](#) (17)
- [UML](#) (14)
- [XP](#) (34)

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Welcome

Welcome to SEED: Software Engineering Evidence Database

Select a topic on the left to see summaries of evidence-based software engineering studies. You may become a registered user if you would like to add a new study and summary, or rate a study.

Note: This rapid prototype was created by David Janzen, [Assistant Professor of Computer Science at Cal Poly](#), and [President of Simex LLC](#), using the drupal content management system. Initial content was supplied by students in the CSC508 Software Engineering I course at Cal Poly in Fall 2007.



SEED: Software Engineering Evidence Database

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Scrum

[Agile offshore techniques - a case study](#)

Mon, 11/19/2007 - 08:30 — mpanian

Author: A. Danait

Conference: Agile Conference

Pages: 214 - 217

Date: July 2005

Your vote:



No votes yet

[Read more](#)

[Scrum](#)

[How Douglas County, CO Cut A Project Timeline In Half](#)

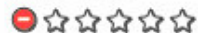
Mon, 11/19/2007 - 08:28 — mpanian

Author: C. Fredrick

Journal: Agile Journal

Date: March 2007

Your vote:



How Douglas County, CO Cut A Project Timeline In Half | SEED: Software Engineering Evidence Database - Mozilla Firefox

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http://www.evidencebasedse.com/?q=node/195

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How Douglas County, CO Cut A Project Timeline In Half

Mon, 11/19/2007 - 08:28 — mpanian

Author: C. Fredrick
Journal: Agile Journal
Date: March 2007

This experience report talks about a Colorado county IT department's experience using Scrum to lower project estimates on a program to track sex offender registration. The team needed to deliver a project in half the projected time of a waterfall implementation. The report talks about picking the right members for a team, making sure to select someone open to change when transitioning from an old method to a new one. The team also believes that being co-located made a huge difference in their productivity. One big part of their increased speed is a large reduction in complexity. Utilizing tools such as the Google Maps API and Hibernate saved the team a lot of coding time regardless of using waterfall or Scrum.

Two problems the team encountered while trying to use Scrum was organizational change and personnel change. Some people in the organization, such as Businesses Analysts, were scared their job roles were going to be replaced. Others were just not comfortable working in a less structured environment than they were used to.

Your vote:

No votes yet

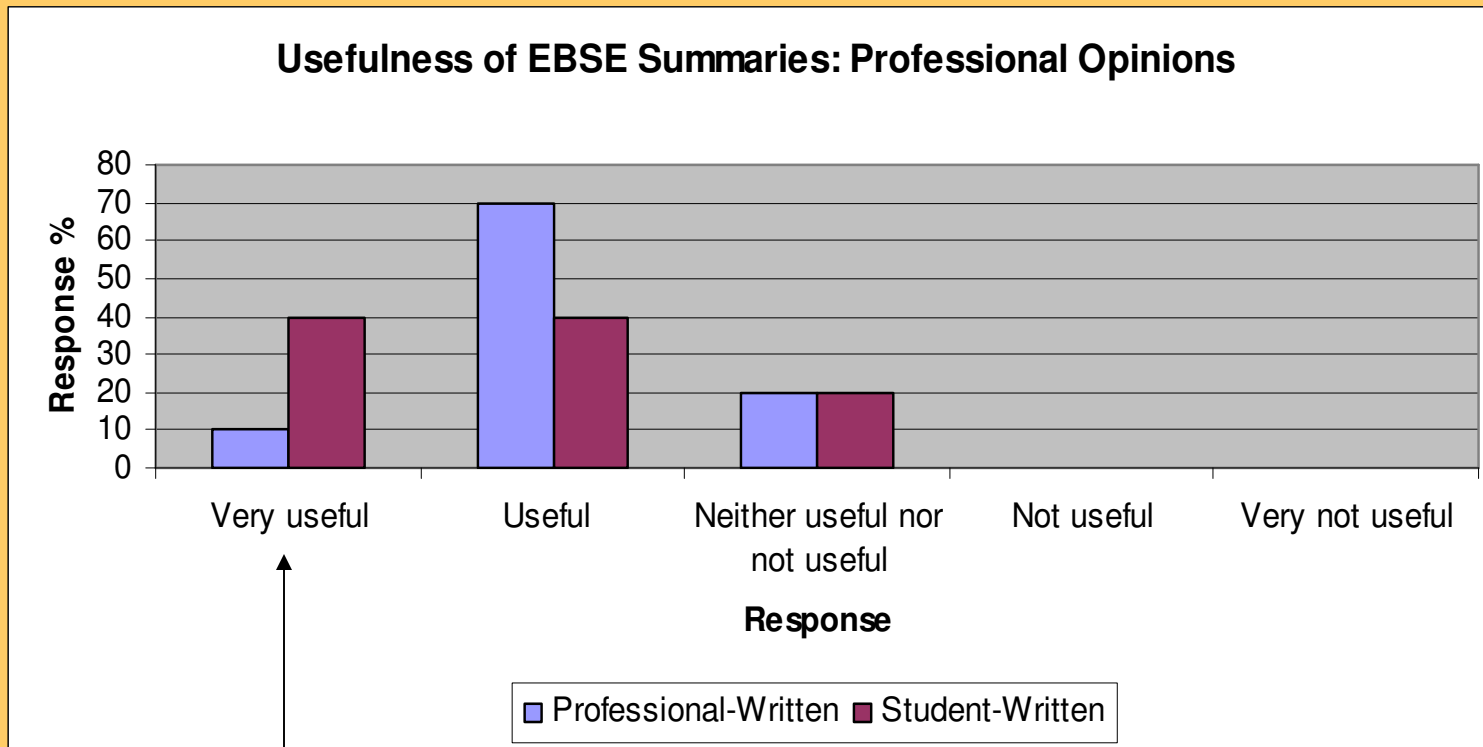
[Scrum](#)

Done

Assessment #1

- How did the student EBSE summaries compare to those in other repositories?
 - Survey sent to industry practitioners in four companies: Amgen, Google, Intuit, LSI
 - Ten respondents
 - Compared to Empirical Research Repository hosted by Durham University
 - Summaries produced by researchers with strict inclusion guidelines

Usefulness of EBSE Summaries: Professional Opinions



Practitioners found student surveys more useful

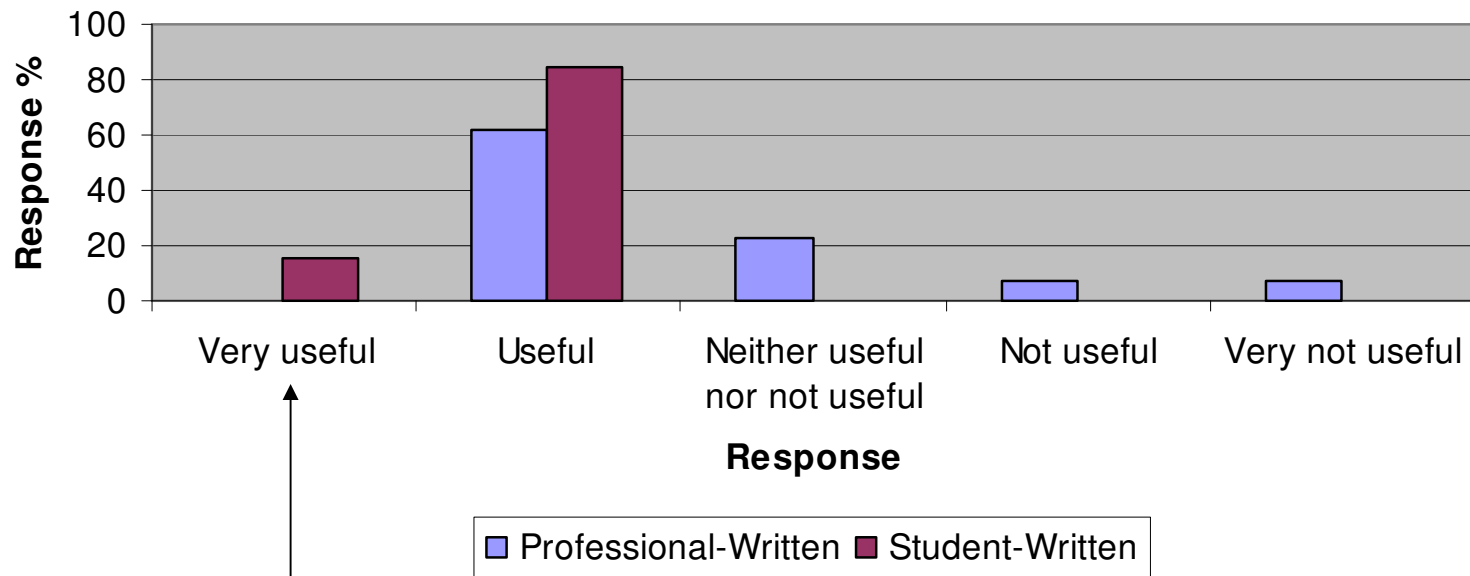
Interesting Additional Results

- Of the ten industry respondents
 - 5 had access to ACM or IEEE digital library
 - 7 had never read an EBSE study report
 - 3 thought they understood how EBSE techniques were applied to SE
 - 7 were likely to find and read EBSE studies prior to adopting an SE practice, process, method, or tool

Assessment #2

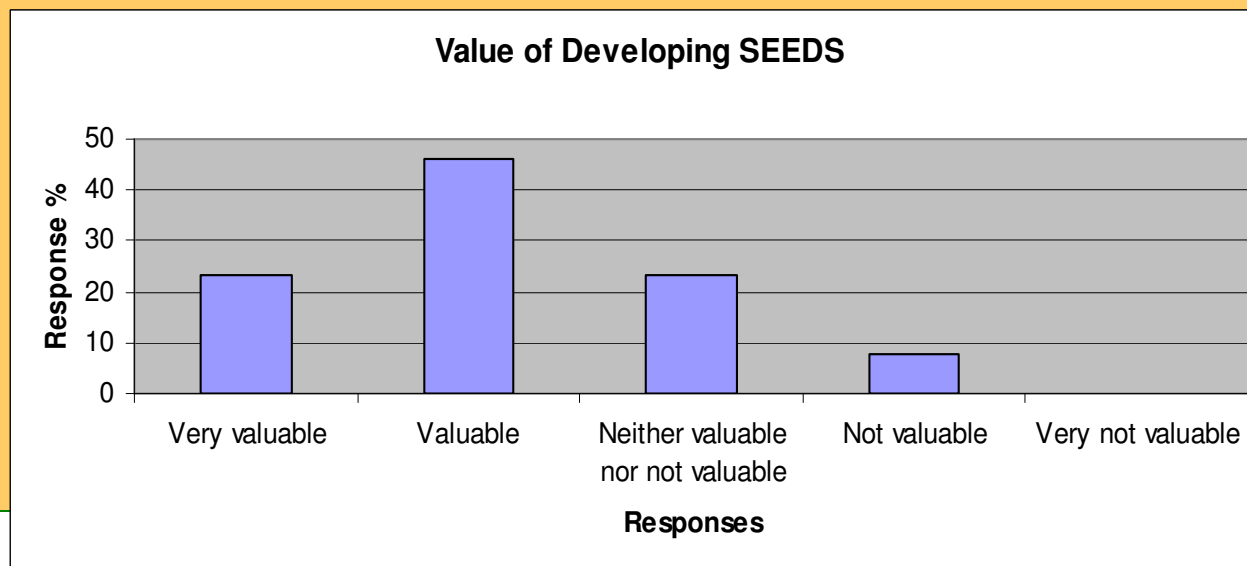
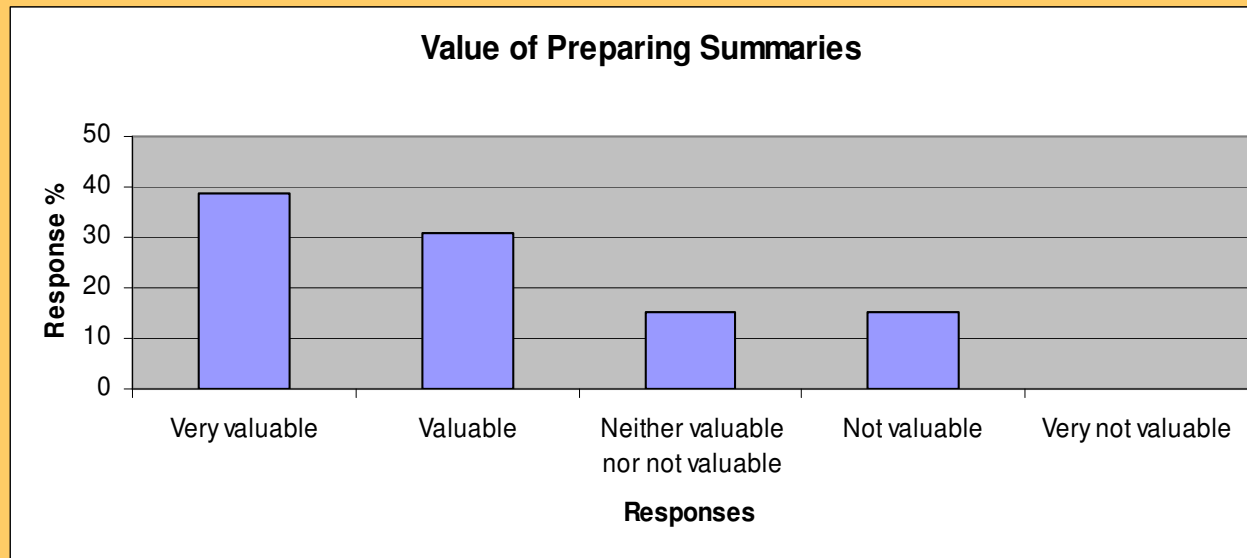
- How did the student EBSE summaries compare to those in other repositories?
 - Survey given to students in the class
 - Again compared to Empirical Research Repository hosted by Durham University
 - Summaries produced by researchers with strict inclusion guidelines
 - Students had not seen this repository previously

Usefulness of EBSE Summaries: Student Opinions



Students found their own surveys more useful

What did students think of the experience?



Wrap Up

- Visit and contribute to:
<http://www.evidencebasedse.com>
- Improve SEEDS
Email: djanzen@calpoly.edu
- Questions?