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Enhance Capstone Projects with a New Online Collaboration System

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***Abstract*—This paper presents a new online collaboration system for capstone projects and other project-oriented courses. Unique features such as project grading, social media integration, and document review are proposed. This project is developed based on the open sourced project management system, Redmine. The Ruby on Rails in Redmine provides a fast and effortless development tool for added features. Our modified Redmine will be replicated freely elsewhere.**

Keywords-computer science eduation; capstone projects;Project managmenet; Ruby on Rails, Online collaboration systems; Redmine;

I. INTRODUCTION

Capstone projects allow senior undergraduates to bring together skills and concepts learned during their undergraduate studies to solve real-world problems. The Computer Science (CS) capstone projects are designed to involve teams of student, faculty, real customers, and CS Industry Advisory Board (IAB) members. Students are organized in teams, each of which solves a real-world problem according to a customer's need (from industry/ faculty/ staff). The CS faculty and the IAB members evaluate the projects in terms of a set of pre-defined rubrics. However, the lack of a centralized project portfolio makes difficult to monitor, collaborate, and review the project development. Moreover, project evaluations typically are arranged at the end of a semester, in which students receive review comments but do not have any chance to correct their projects. It has been an impediment to student learning. Another scenario is that a wrong requirement is found by a customer after a couple of weeks later, which will slow down project development. We advocate that any change/comment/correction should let the students know as soon as possible before it becomes something bigger. So students may proactively correct the project. In order to provide timely organized information for all parties, there is an urgent need to set up an online collaboration system to facilitate project development and evaluation process. The system will also allow non-institutional participants or students in different departments to access and evaluate the projects.

Based on our prior experience in teaching capstone projects, students do not know what required items are for minutes, reports, or other documents such requirement analysis, design, implementation, and testing. As a result, some team missed reporting important items or gave an incomplete document. Furthermore, documents from multiple teams are scattered across email, discussion forums, and chat transcripts. These issues will be solved by integrating fillable forms into the online collaboration system. The CS capstone projects are offered in every semester with an average enrollment of 30. Moreover, the system may be used in other project-oriented courses for any discipline.

II. OBJECTIVES

The goal of this project is to develop an online collaboration system to manage multiple projects in a single venue that allows students, faculty, customers, and IAB members to share project information, monitor project progress, and evaluate projects throughout their development courses. With the advent of technology, young generations turn to social media and apps for everything from communicating with friends and family to checking traffic conditions. One of our design goals is seemly integration of the social media and the project management system. Specifically, the design dimensions of this project are:

1. Template based documentation,
2. Document review and tracking,
3. Social media integration, and
4. Project grading

Template based documentation allows instructors to design a form, e.g., meeting minutes, for students to follow by simply filling in required information accordingly. Document review and tracking provides an interface for reviewers to comment on a peculiar document and follow up students responses. Social media integration keeps students posted whenever there is a new event during project development. Lastly, project grading perhaps is the most need among others. Generally, project grading is hard in which how each member in a group will be given a grade. It's impractical and unfair should everyone in a group receives the same grade. Our take in grading is multidimensional which includes peer evaluations, IAB review, instructor's evaluation, and others. To achieve this with minimized effort, a well-design interface for grading should be carefully developed.

There are a number of project management software packages (e.g., Microsoft Project, ActiveCollab [1], BaseCamp [2], and Codendi [3]). However, these project

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management tools are either proprietary or hard to expand their functionalities to suit our needs without actual coding. In order to add features such as project evaluations, and social media integration, it is inevitable to acquire source code and redesign newly added features. TABLE I. lists recent open sourced projects in project management systems along with their developing program languages and major features.

To achieve this goal, we have identify an open sourced project management tool, Redmine (redmine.org), which supports multiple projects and released under the terms of the GNU general public license v2 (GPL). We plan to modify Redmine to support our capstone projects. Specifically, we will develop online fillable forms for meeting minutes, weekly progress reports, requirement document, use-cases, design documents, and revision logs. These customized forms will greatly help students organize their projects and learn project management/development techniques. The centralized document repository enables reviewers to evaluate and monitor projects throughout the project development course. The timely feedbacks from reviewers will improve students' projects and learning.

TABLE I. OPEN SOURCE PROJECT MANAGEMENT SYSTEMS

Project Title	***Developing Languages***	***Features***
Collabtive [4]	PHP, Javascript, MySQL	To-do lists, milestones, instant messaging, calendaring, file management, role-based user permissions, time tracking, tagging, search, reporting, exporting, importing from Basecamp XML, multi-language interface
dotProject [5]	PHP	Calendar, file management, discussion forums, Gantt charts, history, links, reporting, resource management, search, role-based permissions, add-on modules
Endeavour Software Project Management [6]	Java, Java-EE, Relational Databases	Projects, Use cases, Iterations, Project plans, Change requests Defect tracking, Test cases, Test plans, Task Actors, Document management, Project glossary, Project Wiki, Developer management, Reports (assignments, defects, cumulative flow), SVN browser integration with Svenson, Continuous Integration with Hudson, Email notifications, Fully internationalizable
Redmine [7]	Ruby on Rails [8], Relational batabases	Multiple projects, Flexible role-based access control, Flexible issue tracking system, Gantt chart and calendar, News, documents & files management, Feeds & e-mail notifications., Per-project wiki, Per-project forums, Simple time tracking functionality, Custom fields for issues, time-entries, projects and users, SCM integration (SVN, CVS, Git, Mercurial, Bazaar and Darcs) , Multiple LDAP authentication, User self-registration, Multiple languages, Multiple databases, Plugins, REST API

III. WHY REDMINE AND WHY RUBY ON RAILS

The major reason for choosing Redmine for our project is that it provides most of the features we need such as multiple project support, and role-based permissions. Most importantly, it is open sourced. On top of that, Redmine is developed in Ruby on Rails [8], which was used in developing Twitter, Hulu, Yellowpages, Github, 37signals, and the like. As demonstrated by its creator, David Heinemeier Hansson, Ruby on Rails builds a web blog with a database support with very little effort by using its generate and scaffolding commands. These excellent features will greatly accelerate our project development and minimize the effort to achieve our project goals.

IV. REMARKS AND FUTURE WORK

At the time of this writing, we have deployed Redmine on a Linux server running Ubuntu 9.10 with Ruby on Rails 1.8 [9]. Currently, we are developing document review and grading subsystems. This project involves two computer science faculty members, and two students. Upon acceptance of this paper, we should be able to illustrate working modules as what we have proposed.

ACKNOWLEDGMENT

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