PROJECT THE WIKI WAY: USING WIKI FOR COMPUTER SCIENCE COURSE PROJECT MANAGEMENT

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ABSTRACT

Project-based assignments are widely used in Computer Science courses to give students hands-on experience in using the learned knowledge to solve problems. However, despite its importance, management on student projects is usually done in an ad-hoc fashion, with varying degrees of interaction and guidance to students. This paper presents a general, Wiki-based project management framework: project activities are centralized and captured by a dedicated Wiki site, consisting of Wiki pages created by both the instructor and students. The Project Wiki framework supports all types of project activities, and enables flexible and multi-dimension interaction patterns for instructor, individual student and the whole class.

INTRODUCTION

Project-based assignments have been widely used in Computer Science courses [2, 11, 10]; in fact, most recently published CS textbooks include companion web sites offering course project materials, for example, see [7, 4]. By doing course projects, students deepen their understanding on course subject matter and gain hands-on experience in using their learned knowledge to solve problems — the main goal in active learning. However, despite its importance, management on student projects is usually done in an ad-hoc fashion: instructors use different tools and techniques, specific to a particular course or instructor, with varying degrees of interaction and guidance to students.

To address these issues, this paper presents a general, Wiki-based project management framework which can be easily modified and used in typical computer science courses. Using Project Wiki, project activities are centralized and captured by a dedicated Wiki site, consisting of Wiki pages created by both the instructor and students. Instructors create template pages to guide student through projects and highlight key requirements; students create and maintain their own Wiki pages for project planning and logging; instructors review student pages to check project status and give feedback; students can also review and add comments to each other’s Wiki; finally, the whole class can access and edit common group Wiki pages to engage in broader community-style collective learning.

The contributions of this paper are the following:

• we developed a general and flexible Wiki-based project management framework;
• we present the structure and setup of the Project Wiki framework, and explore enabled activities;
• we describe our experience using it in a project-oriented compiler class.

The rest of the paper is organized as follows: Section 2 describes the background and motivation of Wiki-based project management; Section 3 describes the Project Wiki framework, and the users, activities, and typical settings. Section 4 presents our experience using Project Wiki in a project-oriented compiler class. We conclude in Section 5.
BACKGROUND AND MOTIVATION

Wiki and Academic Use

Wiki is considered the latest web innovation on content management and sharing [8]. Using any web browser, a user can visit a Wiki site — a web site running Wiki software, and by using simple Markup text, the user can create new pages, edit existing pages, or restructure page hierarchy and links. The simplicity and flexibility of Wiki make it an appealing tool for content sharing and online collaboration.

Wiki technology is increasingly used by educators in teaching activities [9]. Wikis have been used for collective learning [5], enhancing student interaction [9], online teaching and assessment [3], contribution-style pedagogy [6], etc. In this work, we developed the Project Wiki framework for project management.

Motivation of Wiki-based Project Management

Our interest in Wiki as a project management tool stems from the desire to facilitate all the key interaction patterns in a class project. As shown in Figure 1, in a project setting, as main participants, the instructor, individual student (or team) and the whole class, may engage in five types of interaction: instructor-student (Type I), instructor-class (Type II), student-class (Type III), student-self (Type IV), and class-self (Type V). Wiki can capture and support all these interaction patterns.

In the traditional ad-hoc course management approach, only some of the patterns are used and emphasized. For example, instructors engage in Type I and Type II interaction through checking student and class progress, giving feedback comments or answering questions; however, the other patterns, which would be highly useful in the student learning process: self-monitoring (Type IV), peer-learning (Type III), community-style collective-learning (Type V), are under-utilized or even being totally neglected. Such deficiencies can partly be attributed to the high cost and overhead to facilitate interactions using the traditional approach.

In contrast, leveraging Wiki as a simple and lightweight project management tool, our Project Wiki framework (described in Section 3) can capture all project-related activities in Wiki pages. It enables fine-grained Type I and II interaction, giving instructors complete view of project progress by each student and whole class, and allowing instructors to provide targeted feedback and help to the student and class. It also boosts other important types of interaction: students create their own Wiki pages from given template, write Wiki-based project plan and log progress (Type IV self-learning and monitoring); students can read other’s Wiki and learn from peers (Type III); students also engage in collective learning by contributing to shared Wiki pages and each student become a member of the learning community of the whole class.

A GENERIC PROJECT WIKI FRAMEWORK

In this section, we describe our Wiki-based project management framework, called Project Wiki.
Project Wiki is designed as a generic, Wiki-based framework to manage student projects and facilitate fine-grained multi-dimension instructor and student interaction patterns. We describe the framework structure, the roles of instructors and students as users, and activities supported by the framework.

**Project Wiki Structure**

Figure 2 shows the main page of Project Wiki: the header section displays the course banner and contains links to the commonly used functions of checking site update and search; on the left is the sidebar panel which shows the framework structure and is used for easy navigation; the main area with strong yellow background displays Wiki content.

The framework has four default sections as shown in the sidebar:

- **Project Announcements**: contains announcement pages created by the instructor, and is used for class-wide announcements;
- **Common Corner**: contains collectively developed pages. Both instructor and students can create and modify pages in this section. These pages serve as common knowledge base for sharing information;
- **MyWiki**: the main part of Project Wiki. Each student (or team) is responsible for creating and maintaining the pages under his/her name in MyWiki, and use MyWiki as the central place to plan and manage the project;
- **Wiki Help**: contains help documentation for using Wiki.

A key focal point of Project Wiki is the MyWiki section. Students are required to create Wiki pages for their projects and use Wiki as the primary project planning and reporting tool. To emphasize its importance and encourage student effort, instructors can assign grading credit to student’s Wiki activities.
Users and Access Control

The main users of Project Wiki are instructors, including faculty and teaching staff such as teaching assistants, and all students in the class. Each user uses full name and assigned password to login into Project Wiki. After login, user can create and edit Wiki pages. All page changes are logged by Project Wiki with user’s full name, so one can browse through the update history (using the link in the header), and easily identify all updates to a page, the corresponding author, and update time.

An interesting user is a virtual student named “Harry Portter”. Instructors use this name to create template pages, students can model and extend their own pages from the template. Figure 2 shows a sample template for a lab project, which lists Wiki structure the students should follow in their Wiki pages.

In Project Wiki, instructors can set customized editing permission on each page or group of pages for finer access control; however, this is usually unnecessary, as Project Wiki maintains all change history, page updates can be rolled back using version diffs. The required login authentication also promotes responsible editing; in fact, all Wiki sections except the sidebar panel are open for editing to all users, reflecting Wiki’s sharing and collaboration nature. Users are also allowed to upload binary files such as images, PDF files for use in their pages.

Activities Enabled by Project Wiki

Project Wiki provides a general and flexible platform for project management, and can be used to support all project activities, facilitating the interaction patterns shown in Figure 1 inside a uniform framework.

First and most importantly, student activities are captured and reflected on their MyWiki pages. Instructors create template pages using the virtual student “Harry Portter”, and give students guidance in each new project. As shown in Figure 2, the template specifies tasks the student should perform, and serves as concrete guidelines: in the “ToDo” section, students will draw their execution plan, breaking down the project into manageable pieces and the time estimate for each piece; in the “Project Blog” section, students keep records on their progress on a daily basis, and check against their “ToDo” time schedule; in the “Immediate Results” section, students will document their intermediate findings and results; in the “Issues to Resolve” section, students highlight pending problems to solve, and focus on these issues; students will write project reports in the “Project Report” section.

Student’s MyWiki pages form the basis of Project Wiki, and is the first and key part of a three-pronged
approach for project management and support: student’s Wiki serves as a detailed and rigorous guiding aid to lead through the project (Type I self-learning and monitoring). Computer science projects are typically large size (for example, OS and compiler projects), and require detailed planning and consistent effort. Without a similar guiding mechanism, inexperienced students can easily lose focus; using Project Wiki will help students keep on track. An sample student Wiki page is shown in Figure 3: the student follows the guiding template (Figure 2), builds his own ToDo list, and uses the Project Blog to guide him through the project.

Secondly, student Wiki pages act as a snap shot of project status. By inspecting student Wiki, instructors can obtain more detailed and accurate student and class information; instructor can then provide targeted feedback and help. For example, instructors can write comments to the “Issues to Resolve” section as shown in Figure 4, or instructors can address a common problem in the Common Corner to alert the whole class of it. In this way, Project Wiki facilitates the instructor-student (Type I) and instructor-class (Type II) interaction in a more fine-grained and timely fashion.

In the third prong of Wiki-based management and support, the framework enables peer interaction (Type III) and class-wide collective learning (Type V). A student can view other student’s Wiki, and learn from the method and techniques by others; furthermore, students can also write in other’s Wiki to comment their peer’s work. Project Wiki also enables class-wide collective learning [5]: students can and are encouraged to build and share knowledge base in the Common Corner section.

Leveraging the simplicity of Wiki, Project Wiki is simple to learn and easy to use. Figure 5 shows the intuitive browser-based editor interface. Students can learn to build Wiki pages quickly, and use Wiki as an integral part in their projects.

USING PROJECT WIKI IN A COMPILER COURSE

Project Wiki has been used in a project-oriented Compiler Construction course in our institution. This section presents our experience from this class.

About The Compiler Course

This course teaches introductory compiler construction and the topics include lexing, parsing, intermediate representation (IR), and code generation [4]. The course uses a typical project-oriented approach: students will work through a four-project sequence to build a compiler for a simple yet realistic robot controller language.

Using Project Wiki

Project Wiki is used to manage all project activities in the class. Students are required to develop a plan for each project, carry out their plan on schedule, document their progress, and write project report at finish. All these activities are done through Project Wiki. Using the framework, we created a link for each student in the “MyWiki” section. We also created four common pages, for each of the four projects, in the “Common Corner” as shared knowledge base. Students use assigned password to log into Project Wiki, and have edit permission on all Wiki pages: students can create their own pages, or add comments to other’s page, including other student’s Wiki and the shared pages.

To help students get started using Wiki, we ran a brief demo on how to use Wiki in class. We created templates using the virtual student “Harry Potter”. From students feedback, Project Wiki is considered easy to learn and use, and the templates are very helpful aid for students to create their own pages.

The four projects are evenly spaced in the course, with each taking about three weeks to finish. In the first lab, students get started using Project Wiki and about two-thirds are able to keep their schedule and submit on time; in other labs, the majority of the students are able to submit on time. We use the framework to evaluate student’s progress and give prompt feedback. Based on common issues reflected on Wiki, we scheduled extra class coverage on using compiler tools to help students learn the tools to build their lexers and parsers in the projects.
Collective Learning and Knowledge Sharing

The collaborative nature of Wiki lends easily to collective learning and knowledge sharing. Using the “Common Corner” page, the instructor posts useful tips on compiler tools and resource links. As the course moves along, students get more experienced using the tools, and start to share their own tips and know-hows in the page. Students also write their comments on the limitations and workaround options in using the tools, based on their own observations.

Technology Limitations and Improvements

We use open-source PmWiki software package as the Wiki backend [1]. The easy installation and flexible feature set of PmWiki allow us to build and run Project Wiki quickly. However, our extensive usage also exposes several limitations of using generic Wiki software for project management. One highly useful but unavailable feature is to aggregate information from multiple pages to a single page; without this feature, we have to manually browse through each Wiki page to collect student project information; another common usage pattern — one user acts as the main author and other users can contribute comments, is also not supported, and has to be done by editing Wiki markup directly. As Wiki tools are becoming more feature-rich, future versions of Wiki software may address these issues and provide better support.

CONCLUSIONS

This paper presents Project Wiki, a general Wiki-based framework for course project management. Leveraging the Wiki technology, the framework can centralize and capture all project activities through Wiki pages created by both the instructor and students. The flexible and lightweight Project Wiki framework can be used to support all types of project activities, and enable fine-grained, multi-dimension interaction patterns for instructor, individual student and the whole class.

We are excited to share our experiences on Project Wiki with other educators. The Project Wiki framework and all related information can be accessed from URL: www.cs.uml.edu/~xu/projectwiki.

REFERENCES