

PROJECT MANAGEMENT TOOLS IN THE CLASSROOM: USING THE ATLIASSIAN TOOL SUITE IN THE CLASSROOM

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ABSTRACT

Students are pressed for time, struggle to manage their time, and often do not have the training and tools to help them out. Are there some cost-effective tools that could be used by both faculty and students to help solve this problem? This paper documents the results of analyzing one such tool that could be used in the classroom to help students solve this problem especially for complex and lengthy courses. The Atlassian Tool Suite is analyzed as a project management tool to help students complete their Senior Capstone Project in an undergraduate program in Software Design and Development at a major university in the United States. Both the student perspective and the instructor perspective on using the Atlassian Tool Suite are explored. The benefits of using the Atlassian Tool Suite for students and the university are presented and recommendations for integrating the Atlassian Tool Suite into the classroom are given at the end.

Keywords: project management, project management tools, tools in the classroom

INTRODUCTION

This research paper documents the results of analysis completed when using a common project management tool to help students complete their Senior Capstone Project in an undergraduate program in Software Design and Development at a major university in the Southwestern United States. The analysis of the research results will first be

provided from a student who was working on their Senior Capstone Project and then by an instructor who teaches Senior Capstone Project courses.

Although there are a number of project management tools that could be used to help students solve this problem, an extensive analysis was completed using the Atlassian Tool Suite, as shown in Figure 1.

The Atlassian Tool Suite (<https://www.atlassian.com/>) is a free cloud-based suite of applications that are commonly used by software development teams in the industry to manage the delivery of products using an agile methodology, such as Scrum. The Atlassian Tool Suite consists of several applications that are more extensive than what was analyzed in this paper, which analyzes only the following tools:

- Confluence—document management tool
- Jira—Agile project management tool
- Bitbucket—a version control management system



Figure 1. Atlassian Tool Suite

THE STUDENT PERSPECTIVE

Introduction

The current courses in the undergraduate Bachelor of Science in Computer Programming program at a major university in the Southwestern United States lack an emphasis on using project management tools within them. This has created a significant problem since project management plays an important role in this field. When it comes to managing many of the software projects that are contained in computer programming courses, overall planning is difficult, since the courses are structured to meet certain requirements listed in the course objectives. Without guidance on how to properly organize a project that optimizes productivity, it is hard for students to manage their time properly because their primary focus is to complete the basic tasks before a project is due. This leads to the primary question: Can implementing an industry tool, such as the Atlassian Tool Suite, fulfil the needs of a project management tool that could be used by students in a classroom setting?

Current Tools and Methods Used in the Classroom Setting

Many courses will briefly mention or discuss project management but they don't have high expectations for encompassing the ideas presented. Some courses will provide templates for students to use in situations where Agile Scrum planning is needed or will exempt entire parts of assignments related to using Agile Scrum planning. For a course designed to use a form of Agile Scrum planning, the professor will often provide design report templates, offer resources, or recommend using an industry tool. The problem with this system is that it doesn't provide students a full experience using Agile Scrum planning. "Agile tools ensure a quick response to changes in every stage of production, including team communication, task management, issue tracking, and knowledge sharing" (Alex T, 2019). Using industry standard tools in a classroom setting familiarizes students with tools they will potentially use later in their careers and provides a better understanding of Agile Scrum planning through first-hand experience.

Industry Standard Tools

Using an industry standard tool for project management is beneficial, but the common tools

are complex and many of them require some training and direction. A few common project management tools used in the industry today are Monday.com, Notion, Rally, Atlassian Tools, and Microsoft Project.

As shown in Figure 2, Atlassian Jira is one of the most, if not the most, popular project management tool. The other tools, such as Microsoft Excel and Google Docs, are not usually used solely for this purpose. However, due to their popularity for other purposes, these tools are also sometimes used for project management.



Figure 2. Graph of Most Used Agile Project Management Tools in 2020

These are just a few examples of potential project management tools that can be used by students. Each of these industry tools satisfy the required aspects of project management that students need for their projects. The uses of these tools consist of Agile Scrum sprint planning, creating user stories, reviewing code, collaborating, documenting, and so on. Jira is a well-known industry tool that could greatly benefit students, since it has a variety of features that can assist with project management. "The University of Minnesota uses JIRA in order to involve undergraduate students in development projects in the university to prepare them for the software development market in the future" (Yenin, 2015). While these industry tools are sufficient for the coursework, they are difficult to use when the student is unfamiliar with tools for project management. Using Confluence, Jira, and Bitbucket with no prior knowledge can be overwhelming for anyone, which makes it important to conduct classroom research using tools such as Confluence, Jira, and Bitbucket. To determine the feasibility of using industry tools in a course related to project management,

an analysis was conducted on integrating the Atlassian Tool Suite within the classroom.

Research Project Overview

To perform this evaluation and analysis, a student Senior Capstone Project was used. By utilizing an actual project instead of a mock project, the analysis contained the required depth to conduct a proper assessment of the tools in a classroom setting. Agile Scrum planning was utilized for planning sprints to complete the documentation of the project, which included a project proposal and a technical design report. Overall, the Senior Capstone Project utilized three Atlassian tools that included Confluence, Jira, and Bitbucket.

Confluence

Atlassian Confluence is included as part of the Atlassian Tool Suite and can be used for the documentation that courses require, such as project proposals and design reports. In the Software Development Lifecycle (SDLC) process, Confluence can be used for the initiation and design phases.

For example, as shown in Figure 3, a project proposal is simply a document, but with Confluence, the original student, other team members, or instructors all have the ability to make comments, view changes, and revert the document to the last published version. This makes Confluence a great tool to promote collaboration among team members. The analysis proved that Confluence would be very beneficial to students

since several courses often contain team-oriented projects that require extensive collaboration on documents. A minor problem discovered during analysis related to Confluence's export documents feature, which would be required to submit an assignment to a Learning Management System. When exporting a Confluence document to Microsoft Word, sometimes the exported document contains formatting differences. To resolve these issues, minor changes needed to be made so the source document in Confluence and the exported Microsoft Word document look identical. One workaround to this problem is to export the document from Confluence as a PDF file, making it possible to submit documents for assignments without formatting issues.

Jira

Atlassian Jira is included as part of the Atlassian Tool Suite and is a versatile tool used primarily for Agile Scrum planning, bug tracking, and reporting. "The software can be used by developers, project managers, engineers, managers, and other non-tech business professionals" (Santos, 2019).

Figure 4 shows the capabilities of Jira for sprint planning. The roadmap is a visual indicator of the time constraints and relationships for different application modules. The modules are epics that were created for the application. In the Senior Capstone Project, application modules, such as login and registration, are important to the design

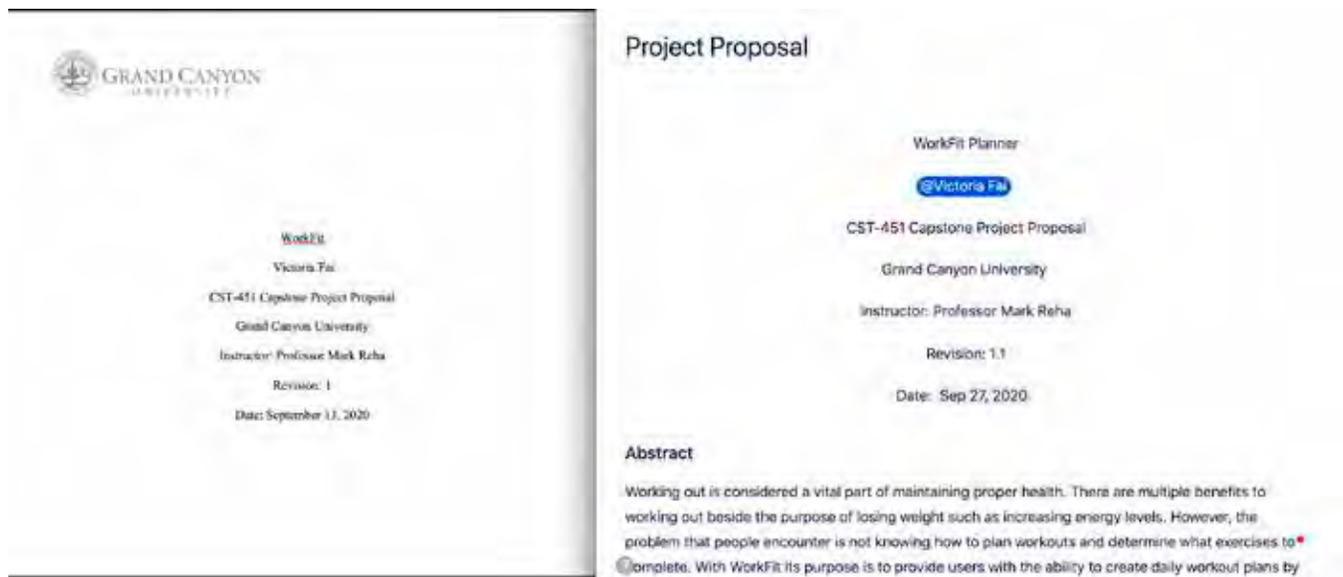


Figure 3. Document Comparison Between a Word Document and a Confluence Document

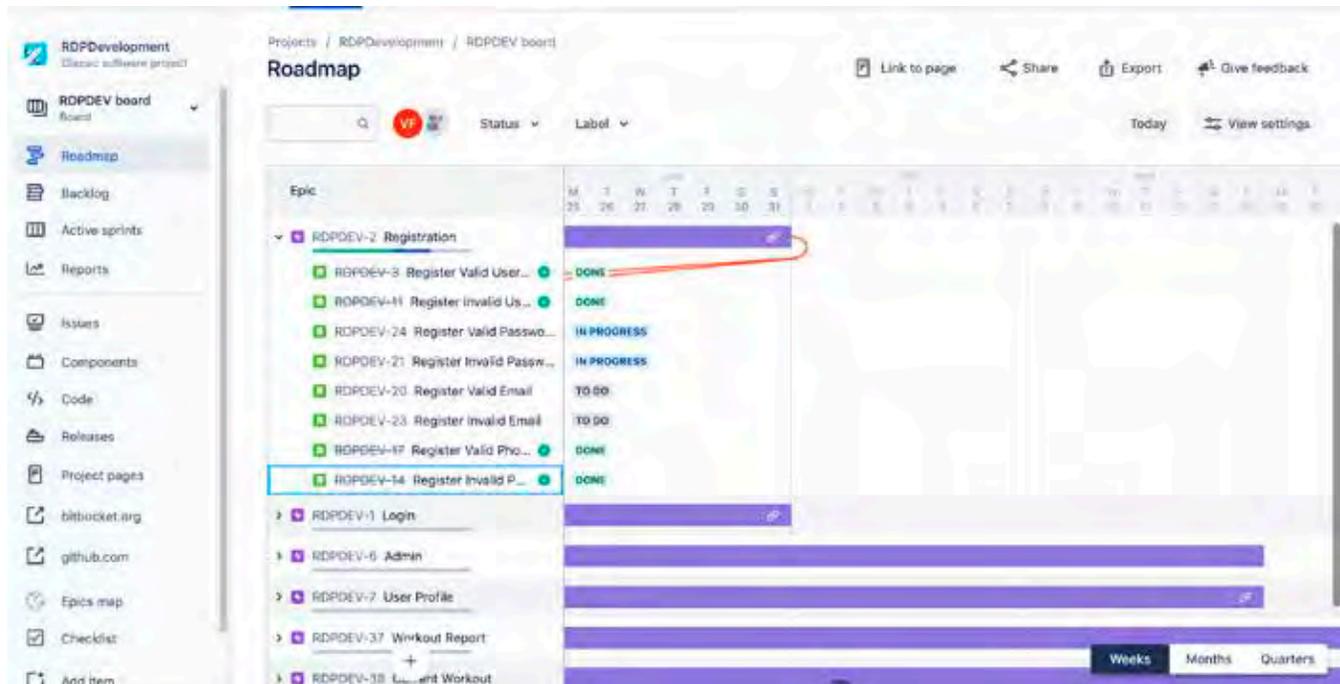


Figure 4. Roadmap of the Project

of the application. As shown in Figure 4, each epic includes user stories and subtasks related to the project. Jira works well for project management since it improves the organization of the entire project. Jira enables users to create custom fields and provides the ability to track code issues all from within the roadmap. Properties, such as time estimation, due dates, etc., can all be included in an issue. Jira allows the user to create sprints from these issues with a duration of time for them to be completed. Once sprints are completed, Jira makes it possible to produce a variety of charts to visually display the progress made from that specific sprint. Jira can also use a visual Kanban board during agile scrum planning. For the Senior Capstone Project, a Kanban board was used in the early phases of the SDLC project for planning what types of documentation needed to be completed. Other phases of the SDLC process, such as implementation and testing, can also utilize Jira. In the end the analysis demonstrated that the overall project organization was streamlined because of the different features that Jira provided in support of the project.

Bitbucket

Atlassian Bitbucket is a source code repository included as part of the Atlassian Tool Suite. Using

Bitbucket is convenient because it has basic features such as commits, branches, pull requests, repositories, and more. These features are also found in other common GIT based tools, such as GitHub and GitLab. Bitbucket is also convenient because it connects to other Atlassian tools, such as Jira. “Bitbucket integrates seamlessly with the Jira task tracking tool—perhaps unsurprisingly, given that both are owned by Atlassian” (7 reasons, n.d.).

Figure 5 shows an example of different user stories that are being managed in Jira. This allows improved communication between team members since they can choose a user story from the sprint in Jira or Bitbucket and upload the code to the designated branch in Bitbucket. Testing is an essential stage in the SDLC process, making it

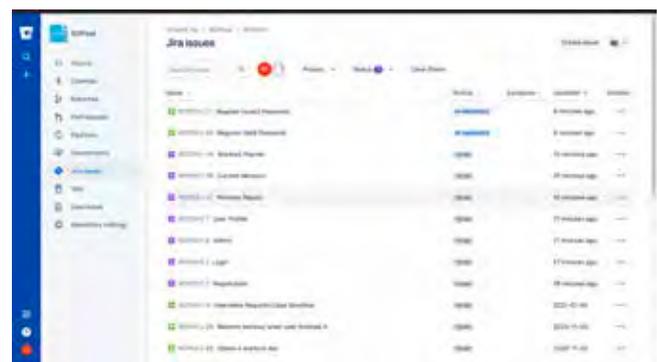


Figure 5. View of Bitbucket Page with Jira Issues

even more important to have proper tools that can make the testing phases easier for a development team. The analysis demonstrated that Jira and Bitbucket working together makes the process of sprint planning and code releases more efficient.

Atlassian Marketplace

The analysis also evaluated the use of the Atlassian Marketplace to find potential tools from third-party companies to assist with managing projects. The Atlassian Tool Suite provides the user with the ability to use add-ons from other companies in their projects. “More than 3000 apps are available at the Atlassian Marketplace to extend the features of the software” (Santos, 2019). For example, a common add-on is used to support GitHub. The GitHub add-on from the Atlassian Marketplace allows you to communicate between Jira and GitHub so a person can avoid the unnecessary challenges of working between the two applications on their own. The Atlassian Marketplace provides a variety of tools that students can utilize. Slack and other common industry tools are also accessible in the marketplace.

Conclusions from the Analysis

When considering the complexity and large number of tasks required to plan, manage, design, and implement the Senior Capstone Project course, Confluence, Jira, and Bitbucket were very helpful for use within the project. Each of the Atlassian tools sufficiently made managing the project easier. Using Confluence, Jira, and Bitbucket cohesively made managing the senior project nearly effortless. Since all three tools can communicate together in some form, the process of organizing a project became simple. Each tool had some negative aspects that sometimes made the process temporarily difficult, but these were mostly minor issues that were easily fixed.

General Use in the Classroom

The Atlassian Tool Suite, as well as other known industry tools, are useful for different project management methodologies. They can also greatly benefit students in a classroom setting, especially in courses that require extensive planning or focus on project management. Basic implementation of the tools within the course structure is imperative, and incorporating the tools should be focused on the following areas:

- Time managing projects by utilizing Jira for sprint planning.
- Collaboration among team members by using Confluence for documentation.
- Bug tracking, peer code reviews, and resolving potential code issues by using Bitbucket.

A variety of other technical courses outside of a Senior Capstone Project course could also benefit from the use of the Atlassian Tool Suite. Jira could be utilized as a project management tool to cover the needs for a variety of methodologies, such as Waterfall and Agile Scrum. Confluence is a perfect tool for courses that focus on planning a project that incorporate multiple forms of documentation. Confluence is ideal because of its versatility and it allows multiple people to work on the same document and communicate together by adding comments and highlighting changes made in the document when it is updated by another team member. For example, a project management course could leverage the Atlassian Tool Suite to teach the concepts of Agile Scrum planning. Jira has the ability to perform Agile Scrum planning and will allow students to better understand Agile Scrum planning in an easier and more visual format. Jira also can create Kanban boards to help the students with planning and documentation before starting the development process. Bitbucket is also useful because it communicates with Jira easily and allows team members to work on requirements and user stories defined in the sprint while performing the basic source code version control capabilities. All these tools were proven useful in this research analysis and could be extended to other courses beyond a Senior Capstone Project course.

Student Benefits

Many students are inexperienced with project management tools. The courses that teach project management and different commonly used methodologies, such as Agile Scrum and Waterfall, are not entirely clear. The ideas themselves are conceptually self-explanatory, but the overall implementation of these methodologies is difficult to learn. For many students, it can be difficult to fully grasp what Agile Scrum is since examples of potential tools that could be used are usually never explained. For visual learners, using the Atlassian

Tool Suite makes the relevance and importance of project management methodologies clearer. Jira made the process easier and was beneficial in multiple ways. For students, using the Atlassian Tool Suite greatly increased productivity since an entire project can be organized in a way to help with time management and it also provided valuable experience with a common industry tool.

University Benefits

Because the Atlassian Tool Suite is free to use, it has the potential to save a university money by allowing students to gain experience using an industry tool without the unnecessary cost that other options might have. This will also provide students with a better understanding of project management and will help students better acclimate to the “real world” after they graduate.

INSTRUCTOR PERSPECTIVE

I am a professor and primarily teach software design and development courses. I also teach two levels of courses for the students Senior Capstone Project that span over two semesters. In the first semester students focus on defining their project through a Project Proposal, Requirements Specification, and Design Specification. This is referred to as the Senior Capstone Project I course. In the second semester students deliver their project by writing code and testing the code by writing a Test Plan and Test Cases. This is referred to as the Senior Capstone Project II course.

In all the software design and development courses that I teach, including the two levels of Senior Capstone Project courses, I always finish the course with a transparent course retrospective. I ask the students what went well, what was challenging, and what needed to be improved for the next students. I often get feedback that is centered around the students own perspective, but I also sometimes will get feedback that is centered around the course itself.

One common theme that I hear especially in the Senior Capstone Project I and II courses is that students are not trained or taught good project and time management skills. The Capstone Handbook, which is provided to all students at the start of their Senior Capstone Project, not only contains the requirements of the courses but also makes suggestions for tools and practices that can be used to help students manage their projects. Currently,

formal project management tools are not required to be used by the students. However, for each code release, students do have to provide Release Notes and a detailed Status Report for the overall progress of their project. “In a way, agile working has a lot in common with the way work gets done in an academic setting, especially if you’re working on something lengthy” (Lang, n.d.). I agree with Lang that, especially for complex and lengthy projects like a Senior Capstone Project, an agile working methodology and project management tools need to be included in these courses.

One solution to help the students manage their time and projects is through the use of the Atlassian Tool Suite, which contains a robust source control management system in Bitbucket, a powerful document management system in Confluence, and a comprehensive project management tool in Jira. These same tools are also widely used in the industry especially in software development-based teams and companies delivering software-based products.

General Use in the Classroom

How could Confluence help students in the classroom? Confluence is a powerful document management system and can be used as a document repository for all the project artifacts created by the students during their Senior Capstone Project, including the Project Proposal and Technical Design Specification. Confluence also has the capability to create reusable document templates that could be provided to students in their course materials to provide consistency in artifact development.

How could Jira help students in the classroom? Jira is a powerful comprehensive project management tool that can be used not only to act as a repository for all functional and nonfunctional requirements written in Agile User Story format but also to do Sprint Planning and create Kanban boards. This gives students a tool they can use to manage the deliverables of their projects. Sprints also line up nicely with the 3 week-long topics currently designed into the Senior Capstone Project I and II courses.

How could Bitbucket help students in the classroom? Bitbucket is a robust source control management system that can be used to manage code and other artifacts in software-based projects. One of the primary advantages to using Bitbucket

in a student's Senior Capstone Project is through the tight integration with the other tools in the Atlassian Tool Suite. Issues (i.e., software bugs) can be entered in Bitbucket and these issues are then recorded in the Jira project management tool so they can be planned in a subsequent code release.

How could Confluence, Jira, and Bitbucket conceptually be used in Senior Capstone Project courses? The following Table 1 illustrates how the Atlassian Tool Suite, which can be setup by all students for free, can be used in both the Senior Capstone Project I and II courses:

Student Benefits

The following are just a few of the benefits when using the Atlassian Tool Suite in the classroom:

- “It is attractive to educational providers because of its affordable Academic and Classroom Licenses” (Fergusson, 2016).
- “The add-on Atlassian Marketplace has hundreds of plug-ins that are useful for organizational, research and teaching applications” (Fergusson, 2016).
- “It is very easy to use compared to many academic or enterprise collaboration tools” (Fergusson, 2016).
- “Confluence allows for varying levels of privacy, making it ideal for sharing information between internal faculty working groups or research groups, within subjects or between student groups, across faculties and research groups, and offering accessible information on the web” (Fergusson, 2016).

University Benefits

There are a number of major universities across the country who are already using the Atlassian Tool Suite in a variety of ways. The following are just a few examples:

- “Universities such as Stanford, Cambridge, and MIT have integrated Jira and Confluence solutions for project management and customer service functionality, in addition to document collaboration in research and student groups” (Fergusson, 2016).
- “At Purdue University, students studying Educational Technology and Computing

were taught and evaluated exclusively within Confluence” (Fergusson, 2016).

- “Berkeley Labs at the University of California allows all its students and staff to create spaces on their Confluence instance and encourages sharing content with collaborators outside the university” (Fergusson, 2016).
- “Cornell University uses both JIRA and Confluence to manage and document projects and research across the entire university” (Fergusson, 2016).

SUMMARY AND RECOMMENDATIONS

Based on our research, analysis, and conclusions of the Atlassian Tool Suite, we recommend making the following changes to technical programs within a university to assist the student with better time management and delivery of their Senior Capstone Project, as well as other projects included in other technical courses.

1. Leverage a tool, such as the Atlassian Tool Suite, to provide students with the proper tools to help them with time management.
2. Leverage a project management tool, such as the Atlassian Tool Suite, for all upper-level software design and development courses including lengthy and complex Senior Capstone Project courses.
3. Integrate the Atlassian Tool Suite into a Project Management course to help introduce students to modern agile project management concepts and provide them with the tools to learn project management.
4. The Atlassian Tool Suite is powerful with lots of features and capabilities. However, with that power, it introduces complexity with a steep learning curve. It is strongly advised to make sure students are given the proper instruction and practice prior to the tool being formally used in the classroom or before the students enter the workforce.

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