Comparative Study of APM Tools

[1]Jagpuneet Kaur Bajwa, [2]Jaspreet Kaur
[1,2]Department of Computer science**,** Punjabi University, Patiala, Punjab, India
[1]jagpuneetbajwa@gmail.com, [2]jaspreet.maan92@gmail.com

Abstract

Agile Project Management tools form the backbone of mature software development projects. There are various tools that companies are using to support their agile processes for project management and bug tracking. Whenever an organization starts the software development, they look out for a good tool to manage their agile processes. Agile Project management tools have overtaken the manual tools (physical cards, task boards, charts etc.) in almost all the companies. Nowadays, there are a number of web-based tools available. The purpose of this paper is to study and compare the popular APM tools which are currently being used to support agile processes. In addition, to analyze them on the basis of their functionality, common characteristics, distinguishing features and pros and cons of each tool, in order to find out which one is most complete and better to help agile teams in project management process.

Keywords: Project Management, APM tools, Software Development, Systematic literature review.

Introduction

Nowadays, project management tools have been widely used to manage agile projects. These tools help an organization in reducing the product development time. The proper use of project management tools has a great impact in the success of a project. There are many Agile Project management tools available. But organizations need to select appropriate tool according to their requirement which will lead to better project performance.

Reasons for selecting an APM tool

According to a survey, 60-70% of organizations (all sizes) are deploying project management tools for agile processes. There are various reasons for an organization to select a project management tool.

1. The main reason for using these tools is tracking and traceability of work. Organizations use APM tools to track the progress of work or for visualization of workflow. They get to know about what everyone is working on, at what stage each work is, and what is the outcome.
2. These tools are faster and more efficient. This results in increased productivity.
3. APM tools provide executive dashboard.
4. These tools match agile processes.

5. Another reason is, organization does not need to use different tools for different work. An APM tool provides the entire features in one tool. In other words, APM tool replaces multiple tools.
6. These tools can also track defects effectively.

Search process

The search process for this study was a manual search of research papers and journal articles. We went through many educational and scientific sources such as Springer, IEEE Xplore, Google Scholar, Science Direct-Elsevier etc. and we analyzed the white-papers, journals, conference papers and tool usage surveys in the context of Agile Development. Finally, we have found few surveys on agile tools and few studies on Agile Project Management tools. Some of the most relevant works to this study are presented in the literature review.
From the existing studies, we have studied and analyzed the popular Agile Project Management tools on the basis of their features, functionalities, their strengths and weak points. Then we have prepared a comparison table of ten popular APM tools**.**

Inclusion criterion

In our review study, we have included studies that focus on project management tools. Basically, for review we have selected survey studies, comparative studies, white paper, articles which were focusing on agile tools. Next section represents the general information about the studies which we have taken during the SLR process.

Literature review

Pete Behrens [1] in his survey study has inquired about the type of tools used in different stages of development and reasons for selecting or not selecting an APM tool. This survey helps us to prepare a list of tools, criteria and metrics for our table. The survey results showed that agile project management tools have overtaken manual tools across all companies and they use a variety of tools to manage their agile projects.

M. Dubakov et al. [2] in their paper focused on the tools used in agile projects. In this study, authors have discussed the benefits and disadvantages of using different types of agile tools and presented some guidelines for basic tool adoption. The results indicated that many organizations were still using old project management tools like MS Project or spreadsheets for project tracking and planning.

Xin Wang et al. [4] in their paper provided the overview on existing agile planning tools and they have evaluated and compared tools for supporting distributed agile project planning based on tool requirements. They have presented some practical advices for users and designers of agile planning tools.

G. Azizyan et al. [5][6] in their survey study provided list of features that are most desired by existing software companies. According to the results of this survey, the most satisfactory tool aspect is ease of use and the least satisfactory is lack of integration with other systems. This paper helps us to prepare list of tools for our study. The results showed that the most satisfactory tool attribute is ease of use. In another work of theirs, they have presented the results of case study that are focused on the selection of agile tool. This study reveals the problems faced by companies when selecting agile tool for project management and it introduces the methodology for selection of right tool.

Alok Mishra et al. [7] in their paper presented a brief review of popular software project management tools and comparative investigation of these tools. This study has some drawbacks in terms of inclusion of tools for distributed software project management. **Jordi Cabot and Greg Wilson [8]** on the other hand, presented the results of their study of web based project management tool's origin, features and use of these tools. They have compared several popular portals to find out how their feature sets were chosen. From survey results, they found out that most of the web based portals were strongly biased towards agile methods.

Giulio Barabino et al. [9] in their paper analyzed survey results about how applications are actually developed, use of agile methodologies and techniques and tools used for web programming. From the results it was confirmed that a broad adoption of agile methodologies among web developers. Scrum is the most widely used agile methodology.

Dhondoo Sweta et al. [11] in their paper presented the results obtained from survey analysis upon the use of bug tracking tools. The results depicted the inconsistencies between current practices. They have concluded after reviewing the tools that JIRA is powerful tool but many companies prefer open source tools like Mantis BT and TRAC.

J.C. Guzman [12] in his paper presented the results of evaluation of various issue tracking and project management tools. He has described in paper how these tools can be used for no-software type of applications. The results indicated that JIRA tool is slightly better than REDMINE tool. **Noura Alomar et al. [13]** in their study focused on the evaluation of widely known agile software project management tools based on usability assessment criteria and objective and subjective techniques. The results inspired the design of more effective APM tools.

Sonja Dimitrijevic et al. [14] in their study provided a deep insight into the current capabilities and future trends of support for agile requirement engineering practices based on user stories. The results indicated a good coverage of key requirements related to user story management. In their study, they revealed some significant differences in the way different tools support agile requirement engineering concepts and practices.

M. Taheri et al. [15] in their paper proposed a classification model for right selection of agile tool. The results showed that which tools best fit into different projects and companies.

Jan Segers [16] in his study analyzed paper based and software based task board. They have identified and summarized different task board scenarios and examined various Scrum software tools to support the paper versus software task board analysis. Their results indicated that paper based task board are better in terms of several criteria but it depends upon companies' requirements.

Jana Kostalovaa et al. [17] in their paper described the problems of project management and project management tools in a company named Czech Republic. They have analyzed and evaluated the level of project management. The results implied that the most frequent issue in project management in the company was the failure to comply with the project schedule.

Javier Portillo-Rodríguez et al. [18] in their research performed a systematic mapping review to discover the tools available to support Global Software Engineering (GSE). They have presented the results as a general map of types of tools available for GSE, the tool's features and how each tool was validated.

Phillip A. Laplante et al. [19] in their paper presented a rigorous model for selecting a software project management tool using the Analytical Hierarchy Process i.e. AHP. They have also defined a framework for comparing individual product decisions across projects, project managers (PM), organizational groups, and organizations.

Ville Heikkilä [20] in his study reviewed the tools for managing agile projects. He has presented the requirements of one real world agile software development organization in his work. He has described in this study that Extreme Programming (XP) and Scrum are the most prominent agile methods.
Jiri Janak [21] in his research work has examined the most popular issue/bug tracking tools. He has also presented the development of plug-in for NetBeans IDE which will help developers to use advantages of the JIRA tracking system.

Peerasit Patanakul et al. [22] in their paper presented the score of PMTT used in each phase of the project life cycle based on the empirical study of a large sampling population.

V.B.Singh et al. [23] in their paper presented comparative study of bug tracking tools based on classification criteria. They have also proposed a framework for developing bug tracking and reliability assessment system. **Michael Stampfli [24]** in their research work redesigned an issue tracker to keep track of bugs in project and implemented an integrated issue editing plug-in for Eclipse IDE and made this plug-in compatible with the redesigned issue tracker.

Arjan C. Schokking [25] in his study presented comparative analysis of tracking systems. He also provided a review of which tools from the comparison are best suited for a given project situation.

Shivani et al. [26] in their study identified the drawbacks of the current bug tracking systems and they have provided various suggestions and recommendation to users. The results showed that current issue/bug tracking systems lacks certain features which affects its functioning.

Research Gaps

After the systematic literature review, we concluded that software organizations are increasingly adopting a variety of agile project management tools. Although these tools have some common features but their functionalities vary significantly. Thus, the agile project management process is being supported by most of these tools and the choice of a PM tool a company totally depends on tool features. Tools are being selected as per the needs of the users.

Earlier studies indicate that there are many project management tools available and are being developed to help to manage agile projects during their life cycle. Although several studies have been published on these tools but no comparison with specific focus on their features have been reported so far. The evaluation of selection criteria has been encountered.

The aim of this paper is to briefly review various agile project management tools and comparatively investigate their functionalities, different features and usage. We have included both open source and proprietary software groups for comparison. This comparative review will facilitate the understanding of agile project management tools for software practitioners so that they can choose tool as per their requirement.

Comparison of APM tools

	TRAC	**RALLY**	**VERSIONONE**	**JIRA**	**BUGZILLA**	**ASSEMBLA**	**PIVOTAL TRACKER**	**ACTIVE COLLAB**	**AGILO**	**MANTIS**
Company	**Edgewall**	**CA technologies**	**Version One**	**Atlassian**	**Mozilla Foundation**	**Assembla, Inc**	**Pivotal Labs**	**Active Collab**	**Agilo Software**	**Kenzaburo Ito, Victor**
Website	trac.edgewall.org	rallydev.com	versionone.com	atlassian.com	bugzilla.org	assembla.com	pivotaltracker.com	activecollab.com	agilofo rscrum .com	mantisbt.org
Open source	Yes	No	No	No	Yes	No	Yes	No	No	Yes
Creating/configuring projects	Difficult	Easy	Easy	Very easy	Easy	Easy	Easy	Easy	Difficult	Easy
Creating/viewing/closing issues	Easy	Easy	Easy	Easy	Easy	Easy	Easy	Easy	Difficult	Easy
Handle multiple projects	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Customizable workflow	Partially	No	No	Yes	Yes	Yes	No	No	No	Yes
Time tracking	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No

Integration with other programs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Native mobile App	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	Yes
Bug Tracking	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Email notifications	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Advance Search Feature	No	No	No	No	Yes	No	No	No	No	No
Dashboards	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Gantt chart	No	No	No	Yes	No	No	No	Yes	No	No
Suitable for	Small and medium businesses	Freelancers, Small, Medium, large enterprises	Midsized business and large enterprise	Small, Medium, large enterprises	Small, Medium, large enterprises	Small and Midsized businesses	Small, Midsized businesses and Enterprise	Small-medium businesses and large enterprises	Small-medium business, Large business	Small-Medium business, Large business
PROS	Allows very easy bug-tracking	Fast and easy to use interface, integrated defect management	Provides Free trial for up to 10 users, have Robust planning abilities	strong backlog mgt, and have lots of add-ons so PM can customize the software to their team's needs.	powerful Advanced search tool, enhanced communication among and between software developers	It also includes a job/recruitment section	Stories can contain media files	It has ability to limit which user can see what.	Well priced, great communication systems	Very light and simple
CONS	No Gantt charts, supports only one project in a portal at a time, require some programming effort	Requires additional process for linking stories and features to higher-level portfolio items	It takes time to get comfortable, search items need improvement	Switching between apps is difficult, it needs strong learning curve	non-Linux/ UNIX administrators find it hard and confusing to install and run the software on their system	This tool may turn out costly if any extra feature added	it is hard to view all the tasks that are assigned to any team member	Cannot customize workflow	Difficult to learn	Too simple, less integration

Discussion

Plenty of Agile Project Management tools are available in the software industry. We have chosen ten agile tools for comparison. Selection of tools for this comparative study was made based on the popularity of agile project management tool in software companies and by individuals and availability of review. This was done by web searching and studies/surveys focused on project management tools for agile processes. Tools considered in this review are TRAC, RALLY, VERSIONONE, JIRA, BUGZILLA, ASSEMBLA, PIVOTAL TRACKER, ACTIVECOLLAB, MANTIS and AGILEFORSCRUM. These tools have been compared on the basis of their features, functionalities, pros and cons. All of these tools work in web-based environments and provide their services online. Some of the tools are open source and some are from proprietary software groups. TRAC, BUGZILLA, PIVOTAL TRACKER and MANTIS are open source tools. All tools have the functionality of bug tracking, that is to track the bug or issue these tools have the facility to search for the bug that is submitted in the system. Bug tracking is very helpful in identification of duplicate bugs. All tools offer some kind of email alerts to keep everyone informed about the project progress exceptions are ACTIVECOLLAB and AGILOFORSCRUM. Most of the tools support multiple projects to be hosted but **AGILO, TRAC** and **RALLY** only supports one project at a time. TRAC and ASSEMBLA are aimed at small to medium teams. Others are suitable for small-Medium businesses and large enterprises. Basic searches within the tool data are common but only BUGZILLA tool offers Advance Search Feature. Only JIRA and ACTIVECOLLAB use Gantt chart to provide graphical illustration of tasks. All the tools have personalized dashboards with customizable gadgets (the exception is VersionOne).

Companies do not choose a tool on the basis of popularity or their feature sets. They choose that tool which fulfils their requirements and which is best for their projects and under their budget. Although every tool has a set of features or functionalities, every tool has a shortcoming in some manner. Like TRAC requires training for new team members and it supports only one project at a time so it is very simple for large projects. RALLY tool requires additional process for linking features and stories to higher level portfolio items. In VERSIONONE, search facility needs improvement and it takes time for users to get comfortable with this tool as it has complex interface. Although JIRA tool is widely used in companies it also has few limitations like issue deletion is not supported in this tool. If any issue is downloaded and it is deleted on server, it does not delete from the JIRA client automatically. Another shortcoming of JIRA is that it does not have advance search functionality as it supports only exact matches. BUGZILLA has a very simple interface which is not very effective and non LINUX/UNIX administrators find it very difficult to install and maintain. ASSEMBLA tool turns out very costly if any extra feature added. In PIVOTAL TRACKER, it is hard to view all the tasks that are assigned to any team member. ACTIVECOLLAB tool cannot customize the workflow. AGILO tool is difficult to

learn and experienced team members are required for its use. MANTISBT tool has problems with email-notifications. Users face problems with emails as emails sent are treated as spam by recipient's email providers.

Conclusion

In this study, we have reviewed papers and studies published on Agile Software Project Management Tools to analyze and compare the popular tools on the basis of their features, functionalities and usage. It can help the users to choose agile project management tool as per their requirements. There are many challenges in front of the users while choosing a better tool to support their agile processes for project management. Use of tool in a company totally depends on the tool features and on the demand and needs of users. In summary, from the comparative analysis, we have found that JIRA, BUGZILLA, ASSEMBLA and MANTIS provides the highest level of features for managing agile project as compared to other tools. But BUGZILLA and MANTIS are open source tools and other two are proprietary tools. We hope that this comparison of tools would provide some insight to help organizations or individuals to select the best agile tool for their needs.

In our future work, we would want to propose a tool for agile project management. It would be interesting to enhance existing features or add new features. For example, we can merge or integrate project management tools with social networking sites such as LinkedIn and personal life management tools like Google calendar. Other features which can be enhanced are real time dashboards, support for issue deletion and detailed overview of project. These enhancements will improve APM tools for future use.

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