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Citation

Poster: Understanding the Role of Reporting in Work Item Tracking Systems for Software Development: An Industrial Case Study

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ABSTRACT

Work item tracking systems such as Visual Studio Team Services, JIRA, and GitHub issue tracker are widely used by software engineers. They help in managing different kinds of deliverables (e.g. features, user stories, bugs), plan sprints, distribute tasks across the team and prioritize the work. While these tools provide reporting capabilities there has been little research into the role these reports play in the overall software development process.

In this study, we conduct an empirical investigation on the usage of Analytics Service - a reporting service provided by Visual Studio Team Services (VSTS) to build dashboards and reports out of their work item tracking data. In particular, we want to understand why and how users interact with Analytics Service and what are the outcomes and business decisions taken by stakeholders from reports built using Analytics Service. We perform semi-structured interviews and survey with users of Analytics Service to understand usage and challenges. Our report on qualitative and quantitative analysis can help organizations and engineers building similar tools or services.

1 INTRODUCTION

Every enterprise-scale software goes through different phases in its lifetime: requirements definition, analysis and design, development, testing, deployment, maintenance. Some of these phases can be split and organized in an iterative process allowing customers to see and give feedback regarding partial deliverables, which effectively drives up the quality of the software to their satisfaction. These tasks and processes are collectively called Application Lifecycle Management (ALM) [1, 3].

There are many specialized software suites which aim to support ALM. Work Item Tracking (WIT) system is one of them as every project requires some sort of coordination to make sure it is progressing towards its goal [2]. It keeps track of work items, which represent tasks that must be completed as part of the project. To understand the overall health and progress of a project, WIT systems can be enhanced with reporting solutions that handle data aggregation and presentation. They can come in the form of extensions or in-product integrations.

In this study, we would like to get a better understanding about which reporting capabilities of WIT systems are used in practice and what are the actual benefits that people get out of them. Given that such reporting tools are deployed at Microsoft and that we can directly contact developers using them on a daily basis, we had a great opportunity to seek answers to our research questions. We decided to conduct an empirical investigation at Microsoft. Our study focuses on users of the Analytics Service, which provides data for all the reporting capabilities of the Visual Studio Team Services suite, a standard ALM solution used at Microsoft. We refer to Analytics Service as AX throughout the paper. In this study we aim to answer the following high-level research question - *Why are customers using Analytics Service?*

Our study comprises a number of investigative techniques. We interviewed and surveyed developers from a diverse group of products. We also examined activity logs for internal users to better quantify the extent of patterns observed in the survey.

We expect the empirical result that we present here to highlight important aspects of reporting solution for WIT systems, specifically, what charts are the most helpful in different phases of the Software Development Lifecycle, what are the benefits that they provide already. Finally, we hope that the results will be generalizable to ALM suites other than the one used in this study.

2 METHODOLOGY

Our methodology consisted of two parts: interviews and survey.

Interview Protocol. For interviews, we follow an approach based on Grounded Theory [4] to explore how customers use AX, the insights they are trying to get from the reports, challenges and the outcomes of using them. We interviewed 11 developers who are active users of Analytics Service.

Survey Protocol. Using card sort methodology, we created a survey to validate our initial observations and further understand how users interact with AX, what insights they are trying to extract, the challenges they face and the outcomes they get. Our survey aimed to quantify the responses from the user interviews.

3 FINDINGS

This section gathers selected findings for the first research question and the first 10 most common use cases. Remaining results were omitted from this proceedings version of the paper.

AX provides several capabilities for users to monitor the status and health of their project. During interviews, we find that people use it differently based on the needs and requirements of their projects. The main use cases of AX that we found in our study are listed below and summarized in Figure 1. The values do not add to 100% as users can specify multiple use cases.
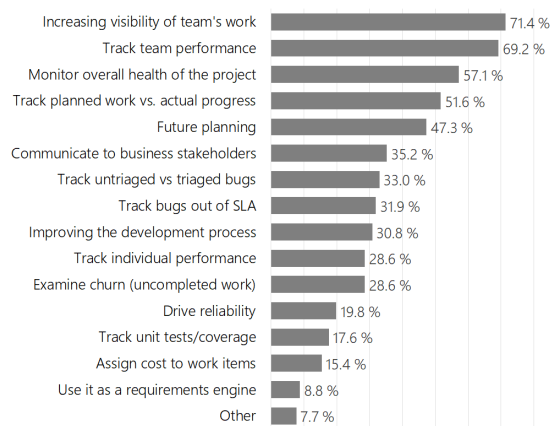

Figure 1: Use cases of reports created using AX

3.0.1 Increasing visibility of team work: AX provides features that makes it easier for teams to track their progress and increase the visibility of what they are working on.

Teams can use reports generated with AX for *"exposing things to the management teams, leadership teams... show them your people are doing this much work for driving your priorities."*

3.0.2 Track team performance: Tracking performance of team is one of the most important part of any software project as it helps with delivering product on time by showing what is the workload of different team members.

3.0.3 Monitor overall health: Teams use AX to monitor the overall health of the project i.e., to ensure items are tagged correctly, assigned to the right people, put under correct iteration path, closed on time etc. - *"I use this to gather hygiene for our teams so that I can fix it when things are not docked correctly."* .

3.0.4 Track planned work vs. actual progress: AX provides users with the possibility to track the amount of work planned against actual progress, thus, making team members accountable for their work.

3.0.5 Future planning: An important part of any project is future planning where key stakeholders decide what they want to achieve against their current status. Features provided by AX helps teams visualize where they stand right now and effectively communicate that to the business stakeholders, who can then take crucial decisions.

3.0.6 Track untriaged vs triaged bugs: AX is used by teams to track bugs that have been triaged against ones that are yet to be assigned. This lets teams visualize which bugs are assigned to whom and accordingly assign new bugs to team members on their current workload.

3.0.7 Track bugs with SLA:. A service-level agreement (SLA) is an official contract between service provider and service user. SLA documents the services that will be provided and aspects of service such as quality, availability etc. that a provider is obligated to meet. Organizations offering Software as a Service (SaaS) products have service levels associated with managing defects that contain conditions by severity level such as response time, resolution time, time to triage etc. Some teams use AX to manage bugs that with SLAs and it helps them prioritize their work.

3.0.8 Improve the development process: Development process defines how the teams are developing software such as agile, waterfall, spiral etc. Several users explained that with AX they can learn new things about their development process and improve it such as clearing up backlog, tagging items correctly.

3.0.9 Track individual performance: Team members work on different work items such as user stories, bugs, features among others and it is important for managers to track who is working on what as well as developers to know which work items are assigned to them so that they can track their own progress.

3.0.10 Examine churn (uncompleted work): AX is used by customers to generate reports to examine the churn of the team, i.e., amount of uncompleted work. This can help teams understand how much is the backlog, what resources and how much time would be required to accomplish those tasks.

4 CONCLUSION

This study demonstrated that there exists great diversity in terms of requirements, scenarios and usage patterns for reporting capabilities of work item tracking systems. For the system to excel in this space it should:

- Be flexible to cover many use cases.
- Be open for people to create reports both for themselves and to share then with the team.
- Provide several consumption mechanisms to make sure reports are available to the right people and in the right location.
- Not only focus on the current state but also allow people to extract historical data for trend analysis.

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