

# Understanding Approval Rating of Agile Project Management Tools using Twitter

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**Keywords:** Agile, Sentiment Analysis, Twitter API, Agile Project Management Tools, Google Trends.

**Abstract:** The role of managing a software project can be extremely complicated, requiring many teams and organizational resources. Many people are acknowledging that Agile development is helpful to business, with an high increase over the last years in the number of people who believe that Agile helps companies to complete projects faster. Since there is a multitude of available tools that supports Agile methods, in this position paper we tried to understand which tools are most looked for using Web Search media, most mentioned and most appreciated through Social media. Furthermore, we applied automated Sentiment Analysis on shared short messages of users on Twitter, one of the most popular social networks, in order to analyze automatically developers' opinions, sentiments, evaluations and attitudes.

## 1 INTRODUCTION

The role of managing a software project can be extremely complicated, requiring many teams and organizational resources. Software projects tend to raise many issues and problems throughout their life cycles. The quality of the final software product is related to how the project has been managed (Mishra and Mishra, 2013). Project Management, then, is the application of knowledge, skills, and techniques to execute project effectively and efficiently. This action typically includes facing the needs and expectations of the project stakeholders as the project is scheduled and built up, as well as identifying the requirements of the project and balancing the project constraints (Heagney, 2011). Recently, the evolution of Project Management tools for both software and non-software applications is speeding up at a rapid pace and, then, the number of available products is growing considerably (Fortune et al., 2011).

Many people are acknowledging that Agile development is helpful to business, with an high increase over the last years in the number of people who believe that Agile helps companies to complete projects faster. Teams and organizations often support their Agile practices using an Agile Project Management tool, defined as a project and work management tool that helps a team or an organization to improve their quality and enhance project agility (Beck et al., 2001). More and more software companies shift towards ag-

ile methodologies to achieve speed, efficiency and quality of the software. They take advantage of the various agile methods such as Extreme Programming (XP), Scrum(Schwaber, 2004) and Lean (Mary and Tom, 2003). Since there is a multitude of available tools that supports Agile methods, we decided to evaluate directly which tools are most looked for using Web Search media, most mentioned and most appreciated through Social media.

Nowadays, Web 2.0 services such as blogs, tweets, forums, chats, email etc. are widely used as media for communication, with great results. Research has established that software engineers use Twitter, one of the most popular social network, in their work to communicate about software engineering topics. Through use of social media services, team members have opportunities to acquire more detailed information about their peers' expertise (Dessai et al., 2012).

The popularity of Twitter is attracting the attention of researchers. Several recent studies examined Twitter from different point of views, including the sentiment prediction power (Tumasjan et al., 2010), the topological characteristics of Twitter (Kwak et al., 2010) or tweets as social sensors of real-time events (Sakaki et al., 2010). Another stream of research focuses on corporate applications of microblogging such as the company internal use for project management (Böhringer and Richter, 2009) or the analysis of Twitter as electronic word of mouth in the area of

product marketing (Jansen et al., 2009). Our aim is to evaluate the power of Twitter in order to understand the level of popularity and appreciation of Agile Project Management tools. We decided to apply automated Sentiment Analysis on shared short messages of users on Twitter in order to analyze automatically people's opinions, sentiments, evaluations and attitudes. We compared our results with one of the most used web search media, Google Trends, and with the related results of published surveys (VersionOne, 2014) (Azizyan et al., 2011) (Mishra and Mishra, 2013).

The body of this paper is organized in five major sections. Section 2, describes the background, section 3 presents the research steps of our study and section 4 summarizes and discusses our results. Finally, Section 5 presents the conclusions and suggestions for future work.

## 2 BACKGROUND

We analyzed the existing literature and surveys on tool usage in the context of Agile development, looking also for "common" sources such as websites, white-papers and published surveys. In the last years, two relevant surveys concerning Agile Project Management tools have been published.

The first is a study conducted by the tool vendor VersionOne in 2013. This is the latest of a series of similar surveys made every year by VersionOne, that is also a tool producer. Most of the survey is focused on the state of Agile development itself (VersionOne, 2014). A total of 3500 responses were collected, analyzed and described in a summary report. The survey is very detailed, including information such as reasons for adopting Agile methods, resulting benefits, roles and so on. They declare that the most commonly used tools still are standard office productivity tools, such as Excel (66%) followed by tools like Microsoft Project (48%), VersionOne (41%), Atlassian/Jira (36%), Microsoft TFS (26%), IBM ClearCase (10%), LeanKit (5%), Xplanner (4%) and Trello (outside the survey choices). In addition to tool usage, the respondents were asked whether they would recommend the tools they are using based on their past or present use. VersionOne had the highest satisfaction of any other tool evaluated (93%), followed by Atlassian/Jira (87%), LeanKit (84%), TargetProcess (83%), Microsoft TFS (79%) and ThoughtWorks Mingle (69%).

The other relevant survey is a study conducted in 2011 (Azizyan et al., 2011). It is an Agile Project Management Tool survey with 121 answers from 35

countries. The survey reports also features, a list of favored tool types and a list of tools that the respondents felt most satisfied with. This survey reports that the most commonly used tool within the companies studied is the physical wall (26%) followed by Microsoft Project (8%), Rally (5%), Mingle (3%), VersionOne (2%), JIRA (2%) and Team Foundation Server (2%).

In order to verify the accuracy of the information reported on the cited surveys, we decided to check these data through a public web service, called "Google Trends"<sup>1</sup>. It is a feature of the search engine that illustrates how frequently a fixed search term was looked for using Google. Using Google Trends you can compare up to five topics at one time to view relative popularity, allowing you to gain an understanding of the hottest search trends of the moment, along with those developing in popularity over time. Following this kind of approach and taking into consideration the list of previously mentioned tools, we are able to evaluate which ones are the most looked for using Google's search engine.

Figure 1 shows the top five of the most mentioned Agile Project Management tools in Google Trends. We found that, nowadays, the most searched tools are, in descending order of search, Jira, Trello, Mingle, Microsoft Project and Team Foundation Server. This graph shows also that, in the time period from 2004 to today, Microsoft Project has been losing popularity in favor of a more and more increasing fame of Jira and Trello.

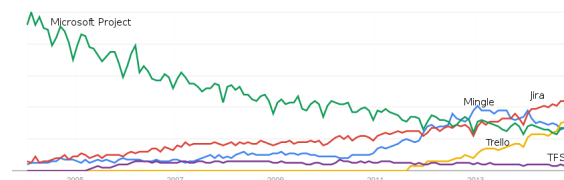


Figure 1: Most mentioned Agile Project Management tools in Google Trends.

## 3 METHODOLOGY

### 3.1 Sentiment Analysis and Twitter

Besides analyzing which are the most searched tools, we wanted to examine what customers really think about them. In the last years, the social web has been commercially exploited for goals such as automatically extracting customer opinions about products or brands, to find which aspects are liked and which are disliked (Thelwall et al., 2011).

<sup>1</sup><http://www.google.it/trends/>

Twitter is an online social networking website and microblogging service that allows users to post and read text-based messages of up to 140 characters, known as "tweets". It seems to be used to share information and to describe minor daily activities (Java et al., 2007). The short format of tweet is a defined characteristic of the service, allowing informal collaboration and quick information sharing. Black et al. presented a survey conducted to collect information on social media use in global software systems development. Twitter was found to be the most popular media and respondents affirmed that specification, source codes and design information were shared over social media (Black et al., 2010). Singer et al. showed that Twitter helps developers keep up with the fast-paced development landscape. They use it to stay aware of industry changes, for learning and for building work relationships (Singer et al., 2014). Romero et al. showed that the aspect responsible for the popularity of certain topics is the influence of users of the network on the spread of content. Some members produce content that resonates very strongly with their followers thus causing the content to propagate and gain popularity (Romero et al., 2011).

So, the tweets sometimes express opinions about different topics, and for this reason we decided to evaluate how much users speak about Agile Project Management tools. In order to evaluate if a user really appreciates the tool, we tried to predict the sentiment analyzing the collection of tweets. By recent years, there is a wide collection of research surrounding machine learning techniques, in order to extract and identify subjective information in texts. This area is known as sentiment analysis or opinion mining. The research field of sentiment analysis has developed many algorithms to identify if the opinion expressed is positive or negative (Pang and Lee, 2008). The strength of the sentiment analysis applied to the Twitter domain by applying similar machine learning techniques to classifying the sentiment of tweets (Go et al., 2009).

For these reasons, we chose to use automated sentiment analysis techniques to identify the sentiments of tweets regarding Agile Project Management tools. Since the goal of this research is neither to develop a new sentiment analysis nor to improve an existing one, we used "SentiStrenght", a tool developed by a team of researchers in the UK (Thelwall et al., ). This tool was implemented to analyze informal short messages. Based on the formal evaluation of this system on a large sample of comments from MySpace.com, the accuracy of predicting positive and negative emotions was something similar to that of other systems (72.8% for negative emotions and 60.6% for positive

emotions, based on a scale of 1-5), and compared to other methods, SentiStrenght showed the highest correlation with human coders (Thelwall et al., 2010). The tool SentiStrenght is able to assess each message separately and, at the end, it returns one singular value: a positive (1), a negative (-1) or a neutral sentiment (0).

### 3.2 Data Collection

Starting from the list of the most used Agile Project Management tools found in the existing literature, we evaluated how many people speak on Twitter about these tools, and what they think about them. The tweets are available and are easily retrieved making use of Twitter Application Programming Interface (API). Composing the hashtags # or @ with the name of the tool, we can see all the tweets that mentioned the analyzed system. The system architecture consists of four components:

- *Twitter Streaming API*: it provides access to Twitter data, both public and protected, on a nearly real-time basis. A persistent connection is created between our system and Twitter. As soon as tweets come in, Twitter notifies our system in real time, allowing us to store them into our database.
- *DataStore*: our datastore consists of a back-end database engine, using MySQL as RDBMS, that repeatedly saves the incoming tweets from the Twitter Streaming API.
- *SentiStrenght Tool*
- *Java Module*: this component allows us to send automated requests to Twitter Streaming API, to recover new tweets about analyzed tools, to parse data gained and to store them into our datastore. In a later stage, these data are sent to SentiStrenght tool in order to evaluate automatically the users opinion.

We analyzed a collection of tweets posted on Twitter between September 2014 and March 2015 regarding the Agile project management tools most mentioned. We found a total of 84837 tweets. We then used the SentiStrenght tool to evaluate the comments extracted from Twitter. Given as input all tweets of every tool previously mentioned, a score for each comment was assigned.

- 1 if the comment is positive
- -1 if the comment is negative
- 0 if the comment is neutral

Table 1: Most quoted Agile Project Management tools ordered by number of tweets.

Number of Tweets	
Trello	32613
Jira	21903
VersionOne	7887
Microsoft TFS	6730
Rally	5684
Mingle	4629
Microsoft Project	2249
LeanKit	1595
TargetProcess	1547

Table 2: Comparison between negative and positive tweets.

Tool	Negative		Positive	
	Total	%	Total	%
Trello	2760	8 %	16569	51 %
Jira	3445	16 %	7043	32 %
VersionOne	808	10 %	2612	33 %
MicrosoftTFS	859	13 %	2290	34 %
Rally	673	12 %	2612	46 %
Mingle	554	12 %	1971	43 %
MicrosoftProj	247	11 %	1055	47 %
LeanKit	89	6 %	829	52 %
TargetProcess	237	15 %	428	28 %

## 4 RESULTS AND DISCUSSION

### 4.1 Number of Tweets Analysis

Of the total 84837 tweets, 39756 were neutral (46%), 35409 were positive (42%) and 9672 were negative (11%). In Table 1, the most quoted Agile Project Management tools, ordered by number of tweets, are shown. XPlanner and IBM ClearCase were excluded since few comments were found about them.

Going back to the results of Google Trends about the Agile Project Management tools reported in Figure 1, we observed a striking similarity between it and the number of tweets we found. In fact, Google Trends reported, in order of search, Jira, Trello, Mingle, Microsoft Project and Team Foundation Server. Taking a look to Table 1, we can see that the rank is similar, with the exception of VersionOne. So, we found that there is a relation between the number of tweets posted for each tool and the Google searches about it. TargetProcess turns out to be the least tweeted, maybe due to the fact that it is a recent tool and it is still little known worldwide. Consequently, it is possible to stress that the most used and quoted Agile Project Management tools on Twitter and Google are Jira, Trello and VersionOne.

### 4.2 Comparison Between Negative and Positive Tweets

From the list of tweets, we evaluated the sentiment using SentiStrenght tool, in order to understand if the users really appreciated these Agile Project Management tools. Among all tweets, we observed that, on average, 40% of the tweets don't represent a sentiment, or SentiStrenght is not able to identify it. After a careful analysis, it was observed that a lot of tweets are neutral because often people wrote texts asking help, non-expressive comments, tweets in a different

language than English, or simple links that lead to other web pages.

An Agile Project Management tool that has more positive than negative tweets is likely to be successful. After this evaluation, we determined that, for all tools, there were more positive messages than negative ones, and that positive messages were almost 3 times more likely to be forwarded than negative messages. In Table 2 we show the data found about positive and negative tweets using SentiStrenght. We observed that, in general, the percentage of negative tweets found in each tool is lower than 14%; Jira, however, achieved 16% of negative comments. In fact, users of Jira sometimes posted tweets in which they explained their problems using the tool.

Based on this result, we found that Trello is clearly the most appreciated tool, getting a high percentage of positive comments (51%) and only 8% of negative comments. Beyond this tool, the other tools with a high percentage of positive comments are LeanKit (52%) and Microsoft Project (47%).

To better quantify the sentiments, we defined the score *PNRatio* as the ratio of positive versus negative tweets on each tool.

$$PNRatio = \frac{|Tweets\ with\ Positive\ Sentiment|}{|Tweets\ with\ Negative\ Sentiment|} \quad (1)$$

The indicator of eq.1 was applied to all tools and Table 3 shows the results. We compared our results to the satisfaction achievement obtained by VersionOne survey, where it is possible. In our study the most quoted (excluding Trello and Rally, since they were not included in VersionOne survey) are LeanKit, Microsoft Project and VersionOne. We noticed that LeanKit and VersionOne also exhibit a high percentage of satisfaction from the survey, greater than 84%. Nevertheless, Trello turns out to be one of the most popular tool, showing a ratio P/N of 6.00, with a total of 16569 positive comments.

In Table 3 we observed a relation between PN ratio and its satisfaction, for most tools. As a matter of

Table 3: Comparison between PN ratio of eq.1 and VersionOne satisfaction survey results by tools.

Tool Name	Ratio P/N	(VersionOne, 2014)
LeanKit	9.31	84%
Trello	6.00	-
Microsoft Project	4.27	53%
Rally	3.88	-
VersionOne	3.23	93%
Mingle	3.55	69%
Microsoft TFS	2.66	79%
Jira	2.04	87%
TargetProcess	1.80	83%

fact, the majority of the tweets represents a positive sentiment while the negative comments are less than 16% and PN Ratio is always greater than 2. Also in this case, we can confirm that the favorite tools are Trello and VersionOne.

### 4.3 Relationship with Agile Methodologies and Approaches

We decided to analyze all tweets in order to assess whether some Agile methodology was mentioned by someone and, in the case, which one of these and in which tool. So, for each tweet, we evaluated if the user cited one of the major agile methodologies and approaches. We chose to test Scrum, Kanban approach, Lean and eXtreme Programming (XP) (Schwaber, 2004) (Mary and Tom, 2003). Table 4 shows the most cited methodologies within the tweets; we can notice that the methodology most mentioned is Scrum, followed by Kanban, Lean and finally eXtreme Programming. About Scrum, we found that the main contribution is given by VersionOne, Rally, Jira and Trello. On the other hand Trello, Jira and LeanKit quoted Kanban approach.

Table 4: Most mentioned Agile metodologies in the tweets.

Methodology	Tot tweets	Tool contribution
Scrum	2021	VersionOne 53% Rally 20% Jira 10% Trello 6%
Kanban	807	LeanKit 34% Trello 40% Jira 12%
Lean	439	VersionOne 30% LeanKit 21%
eXtreme Programming	111	VersionOne 42% Jira 27% Trello 14%

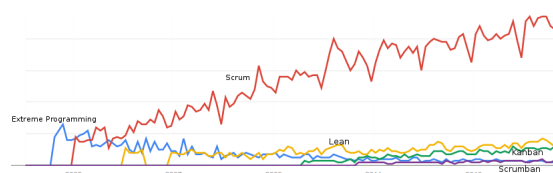


Figure 2: Most mentioned Agile metodologies in Google Trends.

We checked these results using Google Trends, to confirm the ranking found using Twitter. Figure 2 shows the results. Scrum is clearly the most searched word, so we can say that it's the most popular methodology, and its fame is still growing. The popularity of Lean and Kanban are quite similar while eXtreme Programming, over the years, lost most of its fame. In the end, Google Trends confirmed the rankings related to Agile methodologies and approaches found using Twitter. It affirms the growing popularity of Scrum in the last years, and the effectiveness of using tweets to assess the popularity of something.

## 5 CONCLUSION

This position paper presents an analysis of a set of tweets, starting from the results of different surveys about Agile project management tools most used by companies. We analyzed a total amount of 84837 tweets about this kind of tools, covering a period between September 2014 and March 2015. We applied automated Sentiment Analysis on tweets, in order to assess whether the opinions of the users about the examined tool were positive or negative. The aim of this work was to understand which tools are most mentioned and looked for, and, if those who use it really appreciate it. Using Twitter, it was possible to recognize the most mentioned tools, and to evaluate their level of appreciation. This approach is able to give immediate results, reducing the need to submit surveys to users. We can conclude that Jira, Trello and VersionOne are the most twitted and, at the same time, the most appreciated Agile Project Management tools. Google Trends confirms that the fame of Jira and Trello is ever increasing in these years.

In future we plan to extend the increase the number of analyzed tweets, and to perform a complete correlation analysis of the results. We also plan to gather tweets along a much longer time interval, performing trend analysis on the tweets. In this way, we could assign a specific weight to each tweet and check whether the results remain unchanged with the addition of this variable.

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