

Scrum-Based Application for Agile Project Management

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Abstract: Nowadays on projects there are a lot of data and requirements involved. Agile methodology can contribute significantly and in an organized way. One important tool for it is Kanban, a board that project team can easily view task status and evolution. This article presents a mobile application developed for delivering Kanban functionality in a project management software (Jira). The application was developed to help the day-by-day processes and a final survey demonstrated that the result was positive, according to the interviewed people.

Key words: Agile methodologies, Jira mobile, scrum, Kanban board.

1. Introduction

Nowadays on projects involving software development is necessary to keep control over all activities, because a lot of data and requirements are involved and it requires levels of productivity and quality [1]. For helping in this task agile methodology can contribute significantly and in an organized way.

There are many agile methodologies proposed. Scrum, one of the most popular of these methodologies [2], is used in some experiments with great results. In [3], Scrum was applied in the process of creating an optimization algorithm in the class of evolutionary computation. In [4], it was applied for developing SCRUMI, an electronic board serious game for teaching Scrum framework concepts.

Scrum uses many tools for keeping control under all activities. One of them is Kanban, which is a board for exhibiting each issue status in a project. As presented in [5] it brings visibility for activities and helps to improve development flow, increasing team communication and facilitating coordination.

Kanban is supported by some online project management softwares, like Trello and Jira. The focus of this paper is on Jira, that is a tool with planning capabilities. It allows the project manager to plan activities that need to be done flexibly, involving all team in working together for ending task [6]. Kanban functionality in online Jira works very well, but sometimes it isn't practical due to browsers and network connection dependence.

Based on it, the purpose of this work was the development of a mobile application for helping daily processes for those who use Scrum through Jira mobile. It was developed using Ionic 3.2 and Node 8. The programming languages chosen was TypeScript, HTML (Hypertext Markup Language) and SCSS (Sass Cascading Style Sheets). The application was presented to Jira users (development team members and project managers) for a survey to check results: application functionalities, users experience, performance and usefulness.

This paper is structured as following: in Section 2, agile methodology is explained, giving more details about Scrum, Kanban and Jira tool;; in Section 3, developed application is presented, introducing the Kanban application flow and some screenshots; in Section 4 presents the results of the survey of application feedback; and finally the conclusions in Section 5.

2. Agile Methodology

In modern economy, it is hard to predict how a computer system will evolve over time, since conditions (market, user needs, competition agreements, etc.) change rapidly. Users can't define all the requirements before the project starts and for this reason software engineers must be agile enough to respond to a changing business environment.

Therefore, agility is an important methodology where "continuous iterations and testing take place during the entire Software Development Life Cycle (SDLC) of a product" [7]. There are many agile methodologies: XP (eXtreme Programming), ASD (Adaptive Software Development), DSDM (Dynamic Systems Development Method), Scrum, Crystal, FDD (Feature Driven Development) and AM (Agile Modeling).

The focus of this work was on Scrum, once it is one of the most popular agile methodologies in the market [2].

2.1. Scrum

Scrum is based on many principles: small work teams to maximize communication and knowledge sharing and minimization of supervision, adaptive to modifications, available frequent software increments, divided tasks and constant tests and documentation. Table 1 presents a comparison among Scrum and other agile methodologies [7].

Table 1. Comparison between Scrum with others Agile Methodologies [7]

Scrum	Others
Productivity is given topmost priority leading to customer satisfaction and is more flexible	XP: Less flexible and production isn't given much priority
Effective communication among team members, less complexity involved	FDD: Less communication and more complex procedures involved
Better communication amongst team members	DSDM: Less communication amongst team members
Procedures followed are easy and complex	ASD: Complexity in procedural structure
User requirements strictly define development and planning, better traceability	Crystal: Less considerate about user requirements and difficult to trace the work done

"Scrum has gained its popularity in recent few years and has proven to be quite useful" [7]. Scrum focuses on productivity through plan solutions. It provides an efficient process in cases of requirements change, because requirements always change. Scrum is used in teams that can focus entirely on the development of the project or a product in hand, providing a reduction communication cost and increase quality for problems solution [5].

There are some important definitions in agile methodologies: Backlog, Sprint, Demos and Daily Meetings.

- Backlog: Priority list of requirements that will add value to the business. Items can be included at any time, and priorities can be changed [8];
- Sprint: Work unit needed to meet a requirement set in the backlog (typically lasting 30 days). During a sprint, the associated backlog (sprint backlog) does not change [8];
- Demos: Deliverable to the customer, for evaluating functionalities [8];
- Daily meetings: Short meetings (typically 15 minutes) for addressing three basic questions: What has been done since the last meeting? What obstacles were found? What are planned to do before the next

meeting? [8].

For helping in daily meetings, a Kanban board can be presented to team members, giving a broad vision of tasks status. It shows easily what tasks are concluded or on going (informing in which step).

2.2. Kanban

Kanban is a board that helps to keep activities sharing working well. It is a task board that allows evaluation and planning of the project, while also being able to keep-held the manager of projects aware of progress of tasks that are in developed [9].

It supports following the progress of tasks, verifying what has to be done, what is being done, what is in testing phase, what is already finished, depending on the need of the project.

Kanban has some variations, depending of necessity of those who use, for example if the team needs to do documentations, tests, prototypes, and reports. Fig. 1 shows Kanban columns proposed by this work.

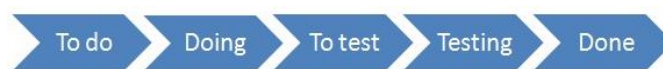


Fig. 1. Kanban Columns contained in application.

When a task is created, its initial state is "to do" and when its execution is fully finished its state is "done". Users can move tasks according with their progress in project, assuming intermediate states as "doing", "to test" and "testing". Tasks can be dragged to the next state by the team member responsible for their execution. Everyone who has permission to access the projects task list can verify what is pending and what has been done so far.

2.3. JIRA

Growing up day by day in the software projects industry, JIRA, created by Atlassian in 2002, is a work item investigator widely used for tracking software bugs and schedules and is also commonly used for agile projects [6]. Powerful closed software helps in many projects based in agile methodology, because due to the possibility to document what are the pending tasks, with all of their properties and attributes. It is a software designed for each member of the application development team to plan, track and bid great software products [6].

The plan is to create tasks, plan sprints and distribute tasks for the entire team, with the possibility to prioritize and discuss the work being done in that context with full visibility. From there, the involved team can use Kanban board for to signal what is happening in project on real time [6].

3. Developed Application

Nowadays, in mobile application market, the most widespread operational systems are Android and iOS [10]. Due to it, it is more advantageous and competitive a developer that dominates both platforms, which takes time and dedication. In order to assist in this issue and to increase the productivity of these developers, tools were developed to enable creating applications that could be used on both platforms, without specific coding for each one.

These applications are called hybrid, precisely because they can be exported to more than one platform from a single code without any changes. Instead of being developed in Java for the Android platform and Objective-C for iOS platform, they are built based on HTML, CSS (Cascading Style Sheets) and JavaScript and can be exported and made available in the platform-specific application stores.

The following subsections present:

- Ionic - a mobile application development framework targeted at building hybrid mobile apps;

- Node - a platform for executing JavaScript codes in the server side;
- HTML – a markup language for developing web pages;
- TypeScript – extension for complex JavaScript codes;
- SCSS – a scripting language preprocessed in open-source Cascading Style Sheets for describing the presentation of HTML documents.

The developed application was based in Scrum, containing Kanban Board. It was integrated to JIRA server and includes drag-and-drop functionality for users (which is one of the most important features for a Kanban tool).

3.1. Flow Chart

The following flowchart (Fig. 2) describes application functionalities. In the first step it is necessary logging in the application in order to check if user has registration and authorization to operate it. After that, user is validated and can see the list of projects. They can choose the action from the list: create a new project, edit or delete an existing project or edit a task. If the user wants to edit a task, it is necessary to select the project from which this task belongs and when it is accessed, the creation, editing or deletion task can be performed. After this flow, user can remain in the project or return to list menu of all projects.

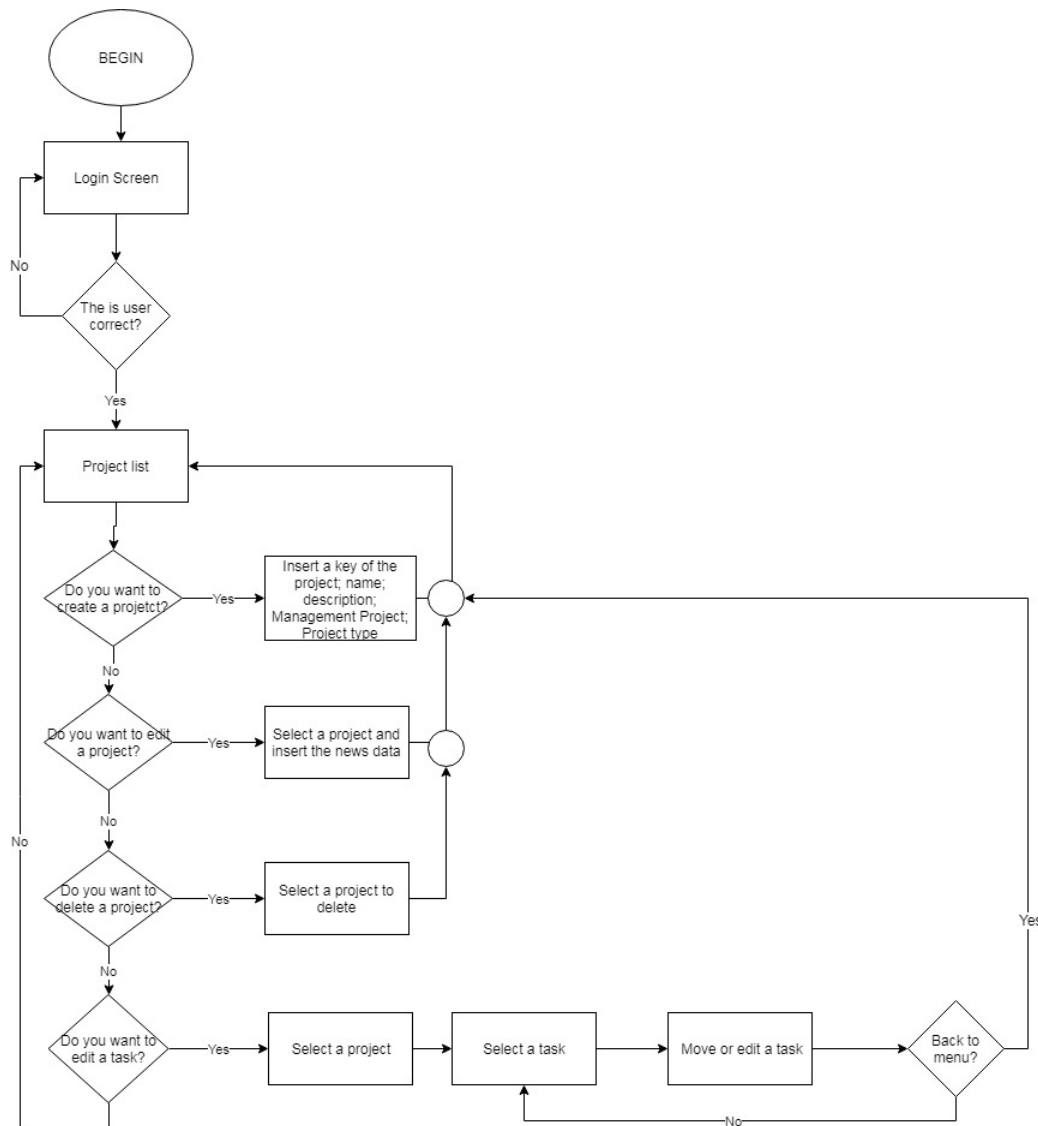


Fig. 2. Flow chart.

3.2. Application

Based on the technologies previously described, an application was developed for implementing Kanban board integrated to Jira project management system. This application can be used on both iOS or Android system. The tests conducted for this work were only over Android, using a test environment from a real JIRA set in Inatel Competence Center (a service provider branch of National Institute of Telecommunications, in charge of developing projects and delivering engineering services for companies).

Fig. 3 shows an example of an application's task list.

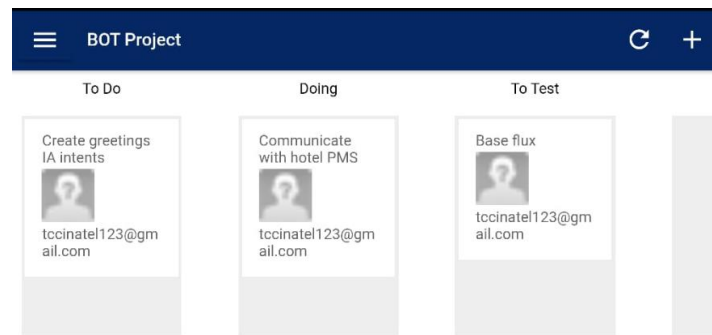


Fig. 3. Task list.

4. Evaluation Survey

It was planned an evaluation survey to verify if the developed application can contribute with day by day of different kind of workers (involved in project development). 30 people were interviewed, being (all of them involved in projects applying Scrum agile methodology): 5 project manager (two of them with PMP - Project Management Professional certification); 15 software developers; 10 other project team members.

From the total of interviewed people, 83.33% of them know and used Kanban, 13.3% only know and the remaining don't know, but heard about Kanban board. Also from the total, 33.33% of the users used JIRA for less than one year, 23.33% for up to 3 years, 20% used for more than 3 years and 23.33% never used JIRA.

Interviewed people were invited to classify four different statements as: Fully agree; Partially agree; Partially disagree; Fully disagree.

For the statement "within the conditions specified for testing, the application satisfies the functional needs", 66.66% of people fully agreed and 33.33% partially agreed.

For the statement "within the conditions specified for testing, the application can be understood, learned and used easily", the answers were: 63.33% fully agreed and 36.66% partially agreed.

For the statement "within specified test conditions, the application provided an appropriate, fast and clear performance for its features", interviewed people answered: fully agree (66.66%) and partially agree (33.33%) (Presented in Fig. 4).

For the level of satisfaction in using the developed application, the statement was "the application met my expectations and would be of great help for my day to day work". The answers were 60% of interviewed people fully agreed, 36.66% partially agreed and 3.34% partially disagreed (Presented in Fig. 5).

Survey was concluded asking the users if they had suggestions for possible improvements of application and some of them answered the following items:

- Show the beginning and ending time of each task that was moved in Kanban board until everything gets done;
- Generate a burndown chart, helping team to see project evolution (burndown chart helps the

- developers showing the amount of work that has been completed and the total work remaining);
- Provide a field for doing internal comments about what was done;
 - Improve the way of cards are dragged to next/previous column, for example using two fingers, instead of clicking on application screen with just a finger the user has the possibility to edit task;
 - Enable full visualization of Kanban, in full screen, to better viewing tasks as a whole;
 - Generate a report in .PDF (Portable Document Format);
 - Include delivery dates of activities and signaling with different colors tasks within deadline and to the ones delayed;
 - Use screen scroll with two fingers and movement Kanban cards with a finger, for instance, for no conflicts.

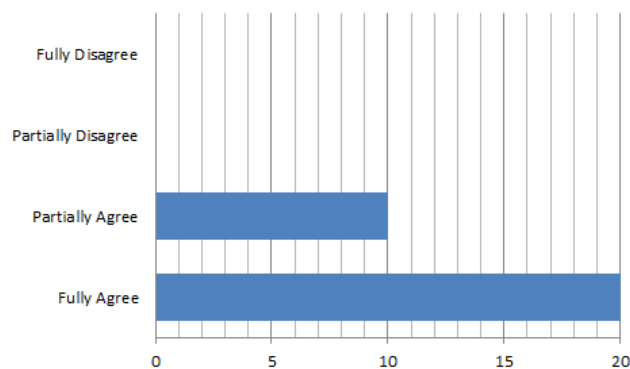


Fig. 4. Satisfaction with efficiency.

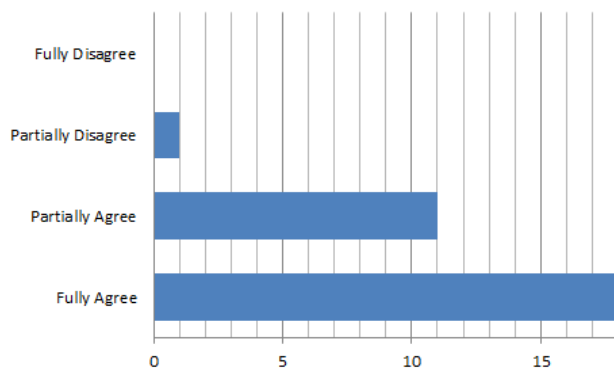


Fig. 5. Satisfaction with application.

5. Conclusion

Agile methodologies present benefits for managing complex projects. Kanban is an important tool for supporting it. There are some software applications for helping project team in managing projects, as Jira. But, its mobile application doesn't support Kanban framework.

Based on this, it was proposed and developed an application for facilitating the control activities carried out in the company's projects, with Kanban. Application was developed in Ionic, a framework that uses web development language to develop hybrid applications.

A survey was carried out to verify users' acceptance of it. The results presented that most of interviewed people approved the application. It indicated that its use could help project team in following activities in a visual way, as provided by Kanban.

During the survey, people also suggested improvements to application. All of them could be considered future work.

The limitation of this work is related to the application of the survey about the application, which was restricted to two different companies. For future work, survey could be applied to more different companies. Additionally, some feature improvement (as suggested in survey) could be developed.

Based on the findings, the authors suggest the use, in agile project development teams, which uses Jira tool, this application for helping project management and follow-up.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Garcia, A. L. worked on literature review, tested the application, applied the survey, and wrote and revised the paper. Miguel, I. R. worked on application requirements, coded the application and. tested the application. Eugênio, J. B. worked on literature review, worked on application requirements, and coded the application. Vilela, M. S. worked on literature review, worked on application requirements, applied the survey, and wrote and revised the paper. Marcondes, G. A. B. acted as research advisor, wrote and revised the paper, and analyzed the data. All authors had approved the final version..

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