Issues and Challenges in Scrum Implementation

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Abstract— The aim of this research paper is to bring the challenges and issues in Scrum implementation to light and proposing solutions for these. For this, a survey is conducted in two companies named Digital Prodigy Limited (DPL) and Bentley Systems Pakistan. Participants include experienced and inexperienced scrum personals from both companies. The analysis of the survey results exposed several issues that affect scrum implementation directly or indirectly and resulting in violation of Scrum rules. Quality items pileup, module integration issues, code quality, disruption in team work, mature vs. immature scrum, sprint duration, lack of Scrum training, release process, backlog management, no technical practices, multiple teams, metrics, risk management, documentation and over idealistic are some examples of these issues. During this study, it has been observed that proper training of Scrum can eliminate half of the issues such as, disruption in team work, immature Scrum, sprint duration and backlog management. At the end, suggestions to address these issues are also provided.

Index Terms— Agile, Agile Issues, Agile Methodology, Distributed Scrum, Issues and Challenges in Scrum, Scrum, Scrum Implementation.

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1 INTRODUCTION

Software Engineering is the technique for the development of software step by step to produce the high quality product at the end. It guarantees the different aspects of software to work as designed by the engineers and allows the architects to improve the quality of the software development efforts. It provides different ways to implement the software with the help of policies, procedures and processes which is called software development methodology (SDM). There are various software development methodologies and each methodology has its own software development life cycle (SDLC). When a team adapts any SDLC for the software development, it actually adapts the policies, procedures and policies within the team to take best outputs of the life cycle such as quality and reliability. SDLC itself does not guarantee the success of the project but helps the team in success. There are several SDLC models e.g. Waterfall, Spiral and Agile but this research is focused on Scrum which is the further classification of Agile Development.

1.1 Drawbacks

Substantial research has been done to perfect the different aspects of Scrum framework such as [26], [6], [12]. Still there are some open research areas which need the attention of the community e.g. [22], [4]. In Scrum Framework, there are some limitations with respect to nature of the work and are highlighted in [13] such as training, management, involvement, access to external resources, corporate or organization size [6], [12], distributed area, sub contraction, developing large and complex systems, but still there are open areas where no significant research work has been done. According to Boehm and Turner (2005) [5], areas of limitations in agile processes are: distributed environments, building reusable artifacts, large teams, and developing safety-critical software. Similarly Sutherland *et al.* (2009b) [26] also considered distributed Scrum as a challenging area where more research work is required.

1.2 Objectives

The objective of this research paper is to minimize the issues and challenges of Scrum in Software Development and propose solutions to some of them. This research paper focuses on the identification of hidden challenges and issues in Scrum implementation and then the formulation of techniques for tackling such issues. It also proposes solutions to these issues and challenges mentioned in existing work by [6] such as documentation, communication, user involvement, scrum ceremonies and client involvement [13]. It also includes solution to social and cultural differences issue which was highlighted by [24].

This research paper also mentions the formal sessions with two organizations to highlight and compare nature of issues they faced in scrum implementation in development. These two organizations are "Bentley Systems Pakistan" and "Digital Prodigy Limited" Each has more than 3 years and 9 months experience in implementation of scrum framework. The difference in experience will help in the analysis of the difference between the issues faced by experienced Scrum teams versus the issues faced by inexperienced Scrum teams.

2 MATERIALS AND METHODS

2.1 Research Methodology

In this research work, Mixed Approach is used to identify and highlight issues and challenges of Scrum implementation with the help of existing work and from experiences of two companies by survey. A survey was designed for this study. The survey was reviewed by peers for readability and by other Scrum experts for content validity. It was distributed to different Scrum experts for more than two weeks. Data was collected from two sources i.e. survey and face to face interview with 20 employees from two companies.

These employees include project managers, scrum masters, development team and quality assurance team.

2.2 Survey

Survey of this research paper takes an in-depth view of the challenges involved in implementation of scrum into two organizations.

Questionnaire for this survey was derived from the views of scrum experts. Survey included 23 questions and these questions are related to scrum formal training, implementa-

tion of basic rules of scrum, managerial and team response, meetings, deployment, testing and release process.

A total of thirty five individuals were asked to participate in the survey. From these thirty five individuals, responses from twenty individuals were received making return rate of 57.14%. The survey was composed of a total of twenty three questions. The individuals were not offered any incentive to answer these questions. These questions covered the areas of Development, Testing and Release Process. The participants belong to the teams that have adopted Scrum Framework. All roles related to software development such as project managers, scrum masters, development team and quality assurance team responded to the survey. The participant's experience ranged from 1 year to 15 years. All of the interviews were audio taped and logged. The received data was stored in a database and later data mining technique was applied on it to find the hidden relation between different concepts. In the process of data analysis grounded theories were used to derive constructs from collected raw data.

3 RESULTS AND DISCUSSIONS
3.1 Identified Issues

Several issues are identified from survey results and from interview sessions. These issues are directly affecting Scrum implementation and are related to management, development and release process. Here is a detailed description of each.

I. Quality Items Pileup

Due to agility of work in Scrum, teams have an obligation to present something in a short time regardless of their scope in "Sprint Planning". Because of this sometimes teams ignore quality of software and create a pileup of quality related items. This may relate to performance improvement steps as well. This is the biggest issue with Scrum Methodology and for that matter with any Agile Methodology.

II. Module Integration Issues

As the products are released frequently during a sprint module integration testing cannot be performed properly all the times, as it requires a lot of time for testing and quality assurance. Inadequate time allocation for QA of large or complex systems can easily generate critical issues.

III. Code Quality

Teams have a short term deadlines due the agility of the teams. To cope up with a lagging deadline, the developer needs to put extra hours. This will create Code Quality related issues. However, one cannot write bug free code all the time especially when he is working under pressure.

IV. Disruption in Team Work

From survey results, it is noted that Product Owner and Scrum Master interfere with team members by asking statuses like they used to ask in traditional SDLC. It has also been observed that client adds the requirements during the sprint. It has been observed that from survey results that interruptions by managers have been reported by 44% of team members, whereas the number of people/employees satisfied by their manager's roles is about 56%.

V. Mature vs. Immature Scrum

This is also proved from results that teams which are ma-

ture in Scrum implementation have relatively fewer issues than immature teams. But the difference is not very big. This is because Digital Prodigy Limited (DPL) is trying to follow scrum rules properly.

It has also been observed that issues identified from DPL survey results are 14% more than the issues identified from Bentley Systems Inc. survey data, which is 43%.

VI. Sprint Duration

Sprint duration plays an important role in effectiveness of Scrum. Scrum Master has to wisely select sprint duration to get maximum benefits of this framework.

Results clearly highlight the number of issues at different sprint duration. 6% of survey participants are facing 2% and 8% issues for two and five weeks of sprint duration respectively. Minimum sprint duration which is identified from survey is one week and their identified issues are more than any other sprint duration issues. 50% of team members are following 1 week sprint and their identified issues are 55% of total. The second most issues are identified from the team members who have three weeks of sprint duration. They are 28% of the survey participants and are facing 29% of total issues which are identified from the survey. It has also been identified that 11% of team members are following six weeks of sprint duration but issues identified from their responses is only 6%.

VII. Lack of Scrum Training

Results also revealed that 50% team members lack formal training of scrum and are unaware of the scrum process. The knowledge that they have gained is either because of the other team fellows or from their scum masters.

VIII. Release Process

Another major issue in scrum is the Release process/ deployment process. Agility in work is introduced by Scrum; sprint deployment is the major concern for every team.

IX. Backlog Management

Scrum provides insufficient guidance with respect to the structure of the backlog. The scrum management tools that are available in the market are either too complex (which in turn are more expensive) or too simple and are therefore not useful for the team. Due to this the teams that have recently adapted Scrum framework for their projects, avoid large investments at initial level of framework implementation.

X. No Technical Practices

Although scrum shows a good project management capability, there aren't any technical practices that can be called "best".

XI. Multiple Teams

The survey showed that working with multiple teams is a tough job, unlike the traditional SDLC methods because scrum doesn't have strong advices on it. Although scrum talks about "Scrum of Scrums" but this technique doesn't work well when the teams are specially distributed. In fact agile is virtually silent on this issue. When working in distributed environment Scrum Masters require lot of work and coordination among all the teams. This is not a failing of scrum but a lack of strong process when working with multiple teams.

XII. Metrics

Burn down charts and velocity is used for measure metrics in Scrum. These metrics can only be useful in the presence of a

Scrum Master or Product Manager who would help in analyzing the burn down chart for its peaks. However, these metrics are often ignored and not analyzed. Burn Down chart is good to show overall status of the sprint in terms of the number of hours that have been spent and the number of hours that are left. However, these burn down charts are not enough to provide in depth detail of that particular day.

As far as velocity is concerned, it is defined as number of tasks/story points completed. There are cases when in one sprint velocity is high and on the very next sprint it is low. This is because it can never be used to identify low or high velocity in a project.

XIII. Risk Management

There is no plan or strategy in scrum to handle risks. It is an important factor for any project and hence work is required in this area of Scrum.

XIV. Documentation

Agile believes in no documentation so does Scrum; however this phenomenon is still not successful in real environment where things come in and out through email or any other source, which is quite difficult to track. From the survey, it has been found that requirements get changed through emails without relating them properly in Product Backlog which creates issues for team in traceability.

XV. Too Idealistic

Scrum assumes teams are of same self-managing. As per rules of Scrum, Scrum master job is to remove all impediments for his team and product owner job is to provide the requirements in stories which will help to build or complete the project incrementally. However in practical this scenario is not valid. It is not possible to make your team self-organized and self-empowered all the time or all team members are self-organized and self-empowered. For instance, a new team member who does not know about scrum cannot have those attributes unless he is properly trained and has gained some experience in Scrum process.

XVI. Communication/Scrum Ceremonies

Due to increase in communication, some team members feel disturbance in their work. They are not able to concentrate properly. Effective communication also adds frequent meetings. Some team members think attending all meetings are unnecessary for them, hence they do not show their interests in those meetings which are not directly related to them.

3.2 Solution for the Identified Issues

In this section, solutions are proposed to some of the issues which are identified in the above section.

I. Quality Items Pileup

Special attention is required to quality related items to increase reliability and in achieving goals such as maintainability and performance. Quality related tasks always helps in achieving factors such as reliability, maintainability and scalability hence it should not be ignored at any time.

II. Module Integration

Teams should spend more time in testing of final internal release. It is highly suggested to dedicate a full sprint for projects which are having tightly coupled modules for testing.

III. Code Quality

Re-scoping for tasks which are missing deadlines can solve code quality issue very easily. The tasks can be divided into subtasks after proper re-scoping. Progress on the task can be shown by doing some sub sections in current sprint moving the rest of the sections to the next sprint. However those sections should be finished in the next sprint as they would be considered as a lag.

IV. Disruption in Team Work

Disruption in Team work doesn't allow a team to be self-organized and self-empowered, which is a strong benefit of scrum. If team is not mature in their work and responsibilities, then it should be made mature first. Proper training and scrutinizing process plays a major role in the maturation of the team. Managers and Scrum Masters should avoid interfering in team work. Let the team do their job themselves.

V. Sprint Duration

It is very important to set sprint duration to the rate at which requirements change and the rate at which the team can deliver a functionality. Adding more work than the team can do makes it difficult to meet commitments and to measure progress and velocity of the team, and new "high-priority" work can disrupt flow.

VI. Lack of Scrum Training

Properly trained teams are far better than the ones having a lack of formal training. They are better in terms of self-organization and self-empowerment. Formal Scrum training helps in acquainting the teams about the working of scrum and in increasing awareness about team rights. Through proper training, teams will be able to better understand the working of Scrum and they will eventually know how to execute and extract the benefits of Scrum for their team and product.

VII. Release Process

Teams have more deployments because the work that they have done is now divided into sprints. Extra care must be taken in case of deployment. A process that can be of great help in this case is the Release Management process. Release Management also requires policies which can best suit to Scrum. This issue can be resolved by better policies and their enforcement in teams.

VIII. Multiple Teams

The major challenge in execution of any agile process including Scrum across distributed environment is the communication issue. Resolution for this is provided in this research where frequent informal meetings can help teams to involve and share ideas other than the work. Introducing extra-curricular activities such as debates (only global matters or interesting matters), conferences and re-allocation can drastically help in resolving this issue. On the other hand, manager needs to realize how critical this issue is and how it can affect the overall performance of the teams. Managers also need to define policies which can help in reducing social and cultural issues. Racism must be prohibited in any environment and effective policy defining can surely help in this matter.

IX. Documentation

Changes should be tractable from Scrum Backlog. If any change comes, it should be added in task story properly. It also helps in referencing and makes the requirement tractable. One more advantage of documentation is to help out the other

developers to understand the business values and goals.

X. Communication/Scrum Ceremonies

Impediment resolution meetings should be conducted with only those team members who are directly related to the impediments. After the resolution, other team members should also be informed about the conclusions of the discussions or meetings. Resolutions should also be added in task stories. Maintaining stories/task descriptions help other team members to track requirement in later sprints.

4 SUMMARY

This paper determines that a large number of factors have an impact on Scrum implementation which are also valid for other agile development methodologies. Issues identified from this survey are Quality Items Pileup, Module Integration Issues, Code Quality, Disruption in Team Work, Mature vs. Immature Scrum, Sprint Duration, Lack of Scrum Training, Release Process, Backlog Management, No technical practices, Multiple teams, Metrics, Risk Management, Documentation, Too Idealistic Scrum and Communication/Scrum Ceremonies. Whereas solution were provided for the following issues which are Quality Items Pileup, Module Integration Issues, Code Quality, Disruption in Team Work, Sprint Duration, Lack of Scrum Training, Release Process, Multiple Teams, Documentation and Communication/Scrum Ceremonies.

REFERENCES

[1] Abrahamsson, P., O. Salo, J. Ronkainen and J. Warsta. 2002. Agile Software Development Methods-Review and Analysis. Espoo. VTT Publications 478. Dept. Information Processing Science, (Univ. Oulu, Finland).

[2] Bates, C. and S. Yates. 2008. Scrum Down: A Software Engineer and a Sociologist Explore the Implementation of an Agile Method. Int. Conf. on Software Engineering (ICSE). (New York, USA) pp. 13-16.

[3] Begel, A. and N. Nagappan. 2007. Usage and Perceptions of Agile Software Development in an Industrial Context: An Exploratory Study. 1st Int. Symp. on Empirical Software Engineering and Measurement (ESEM). (Madrid, Spain) pp. 255-264.

[4] Berczuk, S. 2007. Back to Basics: The Role of Agile Principles in Success with a Distributed Scrum Team. IEEE Computer Society Press. (Washington, DC., USA) pp. 382-388.

[5] Boehm, B. and R. Turner. 2005. Management Challenges to Implementing Agile Processes in Traditional Development Organizations. IEEE Computer Society Press. (Los Angeles, CA, USA) 22(5): 30-39.

[6] Cho, J. 2008. Issues and Challenges of Agile Software Development with Scrum. IACIS. Issues in Information Systems. (Stillwater, OK., USA) 9(2): 188-195.

[7] Cordeiro, L., C. Becker and R. Barreto. 2007. Applying Scrum and Organizational Patterns to Multi-site Software Development. 6th Latin American Conf. on Pattern Languages of Programming. (Porto de Galinhas, Recife, Brazil) pp. 46-67.

[8] Hansen, M.T. and H. Baggesen. 2009. From CMMI and Isolation to Scrum, Agile, Lean and Collaboration. Agile Conf. (Washington, DC., USA) pp. 283-288.

[9] Hazzan, O. and Y. Dubinsky. 2008. Introduction to Agile Software Development. Balancing Agile Software Engineering. Springer-Verlag. (London, UK) pp. 1-24.

[10] Hneif, M. and S. H. Ow. 2009. Review of Agile Methodologies in Software Development. Int. Journal of Research and Reviews in Applied Sciences. (Islamabad, Pakistan) 1(1): 1-10.

[11] Jyothi, V.E. and K.N. Rao. 2011. Effective Implementation of Agile Practices - Ingenious and Organized Theoretical Framework. Int. Journal of Advanced Computer Science and Applications (IJACSA). (New York, USA) pp. 41-48.

[12] Kontio, J., M. Höglund, J. Rydén and P. Abrahamsson. 2004. Managing Commitments and Risks: Challenges in Distributed Agile Development ICSE. 26th Int. Conf. on Software Engineering. (Helsinki Univ. of Tech., Finland) pp. 732-733.

[13] Livermore, J. 2008. Factors that Significantly Impact the Implementation of an Agile Software Development Methodology. Journal of Software. (Oulu, Finland) 3(4): 31-36.

[14] Mahanti, A. 2006. Challenges in Enterprise Adoption of Agile Methods: A Survey. Journal of Computing and Information Technology, JCIT. (Zagreb, Croatia) 14(3): 197-206.

[15] Marchenko, A. and P. Abrahamsson. 2008. Scrum in a Multi project Environment: An Ethnographically-Inspired Case Study on the Adoption Challenges. Agile Int. Conf. (Toronto, Canada) pp. 15-26.

[16] Newkirk, J. 2002. Introduction to Agile Processes and Extreme Programming. Int. Conf. on Software Engineering (ICSE). (Orlando, FL., USA) pp. 695-696.

[17] Rising, L. and N. Janoff. 2000. The Scrum Software Development Process for Small Teams. IEEE Computer Society Press. (Los Alamitos, CA., USA) 17(4): 26-32.

[18] Rychly, M. and P. Ticha. 2008. A Tool for Supporting Feature-Driven Development. Balancing Agility and Formalism in Software Engineering. Springer-Verlag. (Berlin, Heidelberg, Germany) pp. 196-207.

[19] Salo, O. and P. Abrahamsson. 2008. Agile Methods in European Embedded Software Development Organizations: A Survey on the Actual Use and Usefulness of Extreme Programming and Scrum. Institution of Engineering and Technology. (Stevenage, UK) 2(1): 58–64.

[20] Scotland, K. and A. Boutin. 2008. Integrating Scrum with the Process Framework at Yahoo Europe. Agile Int. Conf. (Washington, DC., USA) pp. 191-195.

[21] Smits, H. and G. Pshigoda. 2007. Implementing Scrum in a Distributed Software Development Organization. Agile Int. Conf. (Washington, DC., USA) pp. 371-375.

[22] Sutherland, J. 2005. Future of Scrum: Parallel Pipelining of Sprints in Complex Projects. ADC. Proc. of Agile Development Conf. (Denver, CO., USA) pp. 90-102.

[23] Sutherland, J., C. R. Jakobsen and K. Johnson. 2008a. Scrum and CMMI Level 5: The Magic Potion for Code Warriors. Hawaii Int. Conf. on System Sciences (HICSS). (Washington, DC., USA) pp. 191-195.

[24] Sutherland, J., G. Schoonheim, E. Rustenburg and M. Rijk. 2008b. Fully Distributed Scrum: The Secret Source for Hyper productive Offshore Development Teams. IEEE Computer Society Press. (Washington, DC., USA) pp. 339-344.

[25] Sutherland, J., G. Schoonheim and M. Rijk. 2009a. Fully Distributed Scrum: Replicating Local Productivity and Quality with Offshore Teams. Hawaii Int. Conf. on System Sciences (HICSS). (Big Island, HI, USA) pp. 1-8.

[26] Sutherland, J., G. Schoonheim, N. Kumar, V. Pandey and S. Vishal. 2009b. Fully Distributed Scrum: Linear Scalability of Production between San Francisco and India. Agile Conf. (Washington, DC., USA) pp. 277-282.

[27] Turk, D., R. France and B. Rumpe. 2002. Limitations of Agile Software Processes. 3rd Int. Conf. on eXtreme Programming and Agile Processes in Software Engineering. (Sardinia, Italy) pp. 43-46.