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Comprehensive Review And Adapting The Scrum Framework For Agile Project Management

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Abstract

This study explores the adoption of agile methods for the management of projects in collaborative research initiatives. The scrum framework, a specific set of agile principles and practices for self-organizing cross-functional teams in software development projects, is currently being expanded to other types of organizations and knowledge management processes. Qualitative research methodology was utilized in this study. The data for the current analysis was collected based on interview discussions, analysis of past sprint retrospectives, and sprint velocity data. The participants used for interviews and discussions were from various backgrounds and departments of the case company and included experts such as Scrum Master, Product Owner, Product Manager, Quality Assurance Team, Team Manager, Operation Manager and Software Developers. The study addresses the extent to which key principles and tools usually used in the scrum can contribute to the collaborative management and coordination of tasks in research processes due to their potentially positive influence on team dynamics and efficiency. The research started with the current state analysis of the agile scrum process within the case company's applications development team. Based on current state analysis and literature review, the researcher defined a new process model. The results and conclusions from the piloted iterations were further documented in this study.

Keywords- Agile Methodology, Scrum, Project Knowledge Areas, Project Management, Scrumban, Kanban and Scrum master

1. Scrum Process

Scrum is one of the most commonly used agile software development approaches in the last 10 years. “Scrum is founded on empirical process control theory, or empiricism. Empiricism asserts that knowledge comes from experience and making decisions based on what is known. Scrum employs an iterative, incremental approach to optimize predictability and control risk.” (Schwaber and Sutherland, 2013).

In the Scrum model, an organisation is divided into small self-organizing teams with sizes ranging from 4 to 10 people. According to the scrum practice, a scrum team should be self-organized and cross-functional, and it should have all the needed competencies to accomplish the project without the need for external competencies. The Scrum framework consists of scrum teams and their associated roles, events, artefacts, and rules. Scrum prescribes four formal events Sprint Planning, Daily Scrum, Sprint Review and Sprint Retrospective. Further,

the Scrum Team consists of a Product Owner, the Development Team, and a Scrum Master (Schwaber and Sutherland, 2013).

2. Review, Retrospectives and Daily Stand-up Meetings

These are the very important ceremonies Scrumban retains from Scrum. The review provides the team with direct feedback from product owners and the team's key stakeholders such as product managers and customers. Usually, customers or product managers prefer to have this meeting at regular intervals like in Scrum. Scrumban Retrospective is the place where; the team can improve upon their team rules, improve overall process, constantly look for improvement opportunities and retrospect on how the team can do things in a better way in future, and define ideas to experiment within upcoming iterations. Daily stand-up meetings keep team members up to date on who is working on what, coordinate activities, and know and manage impediments in order to keep the workflow smoother. Again, the main idea is to manage the workflow and use the stand-up meetings as a daily platform to remove impediments.

3. Research Process

The research starts with describing the business problem and defining the research objective. This will be followed by the current state analysis of the Agile Scrum Process used within the Applications Development team of the case company. This team consists of five developers and one dedicated quality assurance member. Further, two developers have dual roles, one is the scrum master and the other is the team leader. The main purpose of the current state analysis is to establish reasons for the needed change in the case company's software development process. The current state analysis will be compiled based on analysing the past sprint retrospectives of the team and analysing the data collected from discussions and interviews of various stakeholders.

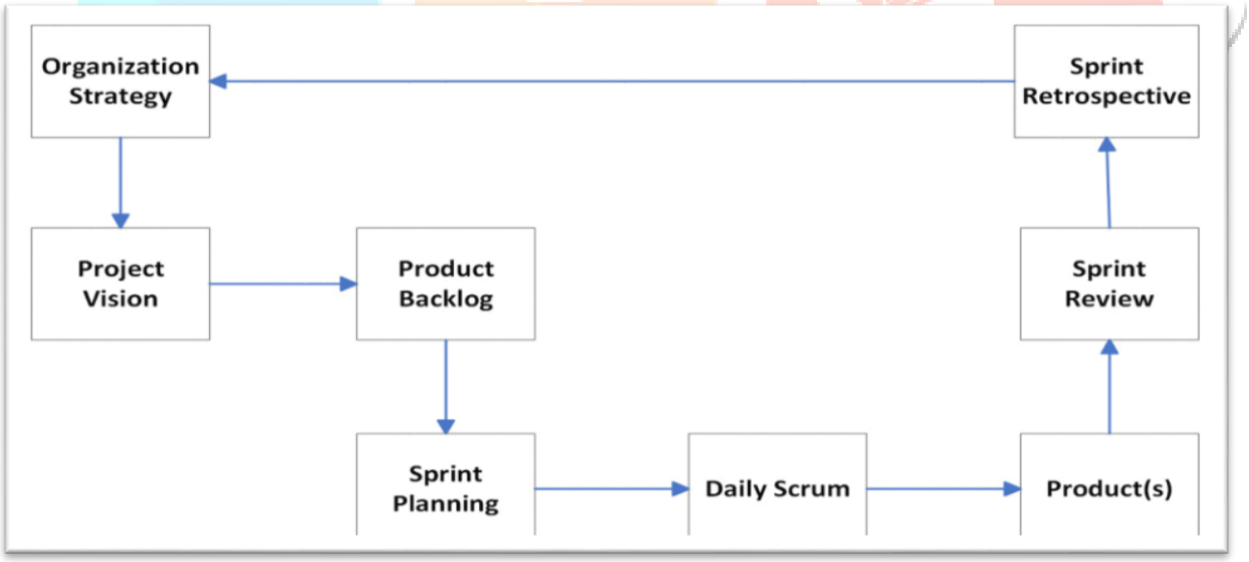

Figure 1. Scrum methodology diagram

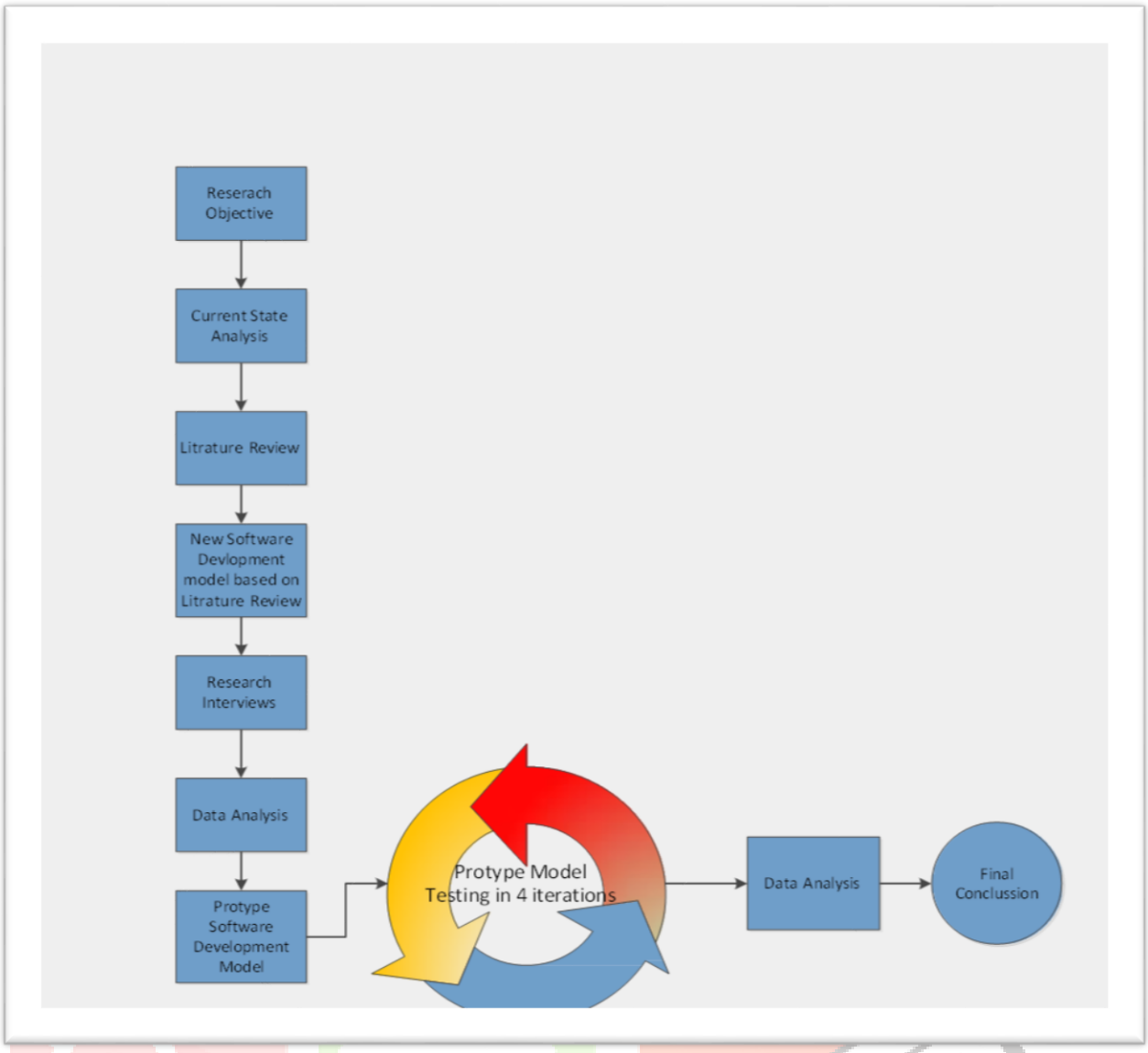

Figure 2. Research design of the study

3.1 Estimations and Metrics

As discussed in the literature review, in the Scrumban, the team shall have smaller and perhaps similar sized backlog items. And once the team becomes better is creating stories based on average size (Average Lead Time), story estimations may not be needed at all. In practice, it is often difficult to split a story or even roughly estimate the story. One of the interviewees, Team Leader, mentioned, “It makes more sense to split the tasks into smaller ones. Sometimes, people are lazy to do that and things keep on dragging for many sprints, however splitting a task doesn’t affect productivity because there are instances when it doesn’t make sense to create too many tasks if only one guy is working on that, it even takes time to create tasks in tools”. Another interviewee, Ex- Scrum Master mentioned, “Splitting bigger tasks will always help, but it is difficult to split a task.”.

3.2 Pull process and planning meetings

In the Scrumban model, team will start using shorter planning sessions in order to fill the slots available in the backlog. Unlike a sprint backlog, Scrumban backlog may be updated more than once within a sprint. In Scrumban, as described in literature review, the idea of having iterations is optional. However, after having discussions with different key stakeholders, it was clear that team will continue to use iteration duration of two weeks so that the Sprint demonstrations and Sprint Retrospectives can be held in synchronisation with other

development teams. In addition, using the iteration model will also simplify the creation of main software release by the end of every sprint.

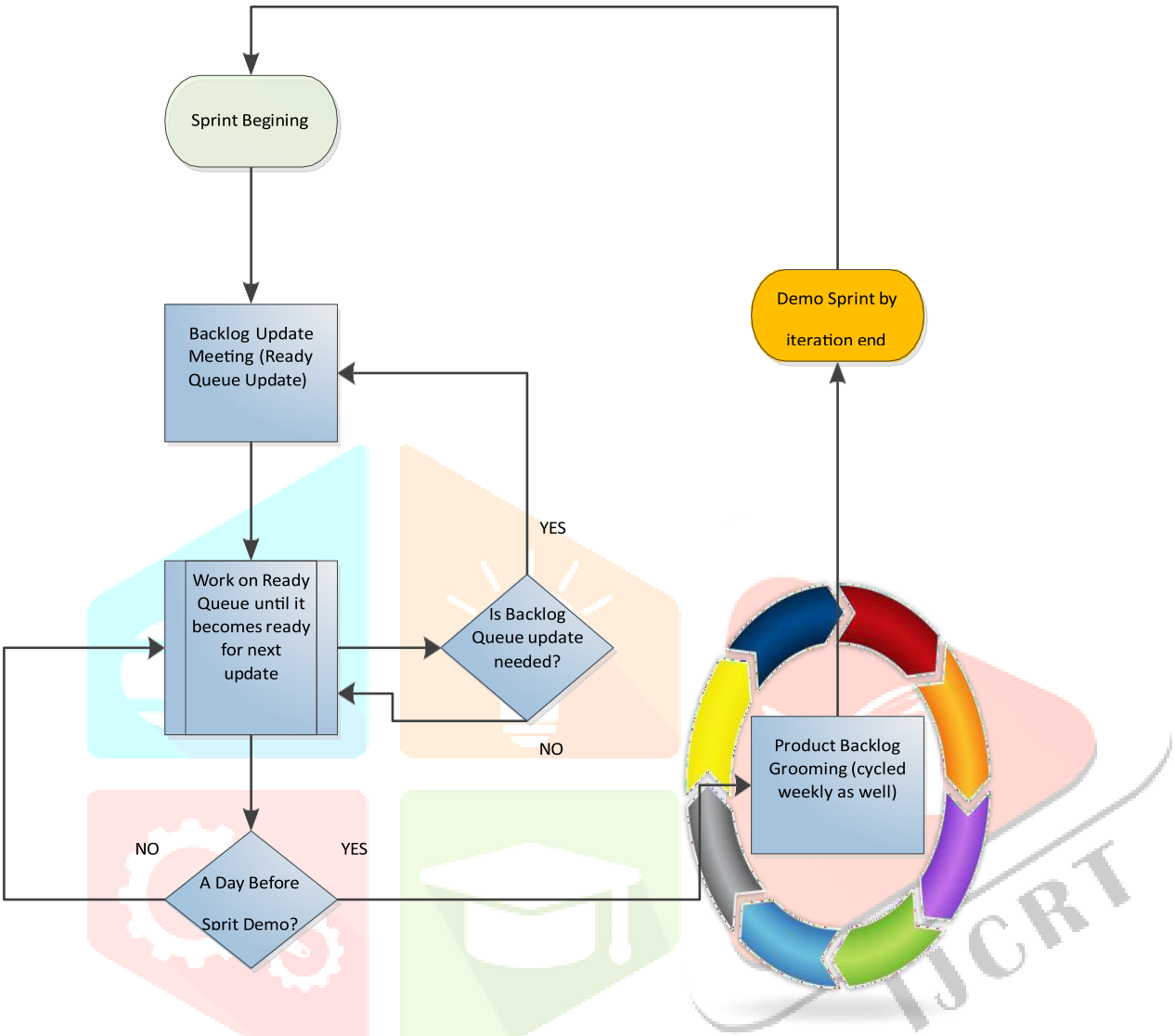

Figure 3. Product Backlog Grooming added to the Scrumban process

4. Data collection and data analysis

The data collection will start with an analysis of the current state of the case company's agile scrum software development process. This will include

1. Analysing all the possible sprint retrospective data of the past twenty-three sprints, because it is mainly the sprint retrospectives in a scrum process where teams highlight and discuss three main questions namely “What went wrong in the last Sprint”, “What went right in the last Sprint” and “What can be improved in the next Sprint”.

Finally, only those problems were presented in the final report as shown in Table 1 which occurred more than once.

Table 1. Details of Data Collection in the Current State Analysis

Data Source	Data Collected	Number Of Sprints
Company Intranet tools like Trello, Jira and Google Drive	Sprint Retrospectives	Data was collected from the last 23 Sprints
Company Intranet tools like Trello , Jira and Google Drive	Sprint Velocity	Data was collected from the last 23 Sprints
Interview and Discussions	Notes, audio-recordings	Not Applicable

2. Interviews and discussions with all the necessary stakeholders within and out-side the development team, within the context of the case company. The participants were selected from within the Applications Development Team, Product Management, Quality Assurance, Ex-Scrum Master of the team and Operations Team. These participants are the main stakeholders who are impacted by the development process used by the applications development teams within the case company. The details of the data collection are presented in Table 2

Table 2. Work In Progress Limits for different Queues in new prototype process

Order	ISSUE or PROBLEM WITHIN A SPRINT	SCORE POINTS	TOTAL
1	Missing collaboration (with product own-ers, sales, inter-team, intra-team, with quality assurance team)/Miss Communi-cation.	1+1+1+1+1+1+1 +1+1+1	10
2	Stressful sprint, loaded work for team members, tight schedules.	1+1+1+1+1+1+1+1+1	9
3	Unclear process, unclear software deliv-ery process for prototypes and products.	1+1+1+1+1+1	6
4	Urgency from management, tasks com- ing from outside the product owners like designers, top management or client managers. Those tasks were not present in team's task management tool such as Jira.	1+1+1+1+1+1	6

5	Not adhering to process, (For example, tasks not present in Jira, Jira not used properly, overlapping tasks, missing acceptance criteria's for tasks)	1+1+1+1+1	5
6	By the end of a sprint, many tasks are stuck in testing phase.	1+1+1+1+1	5

5. Results and Discussions

The data regarding the team velocity was collected from different intranet sources of the case company such as Jira, Google Drive and Trello.

The different sprint metrics, such as velocity per sprint, velocity per team member, average team velocity, average velocity per team member and standard deviation of velocity data are described in Table 3. Velocity per team member is obtained by dividing sprint velocity by the total number of team members present in the team. The total number of team members in the team under discussion is six.

Table 3. Velocity data collected from various sprints

Sprint No.	Velocity (V)	Velocity per team member= V/6	Average Velocity (AV)	Average Velocity per team member= AV/6	Standard Deviation of Velocity (SDV)	Standard Deviation of Velocity per team member= SDV/6
1	56	9,.33333				
2	23	3.833333				
3	41	6.833333				
4	49	8.166667				
5	35	5.833333				
6	32	5.333333				
7	34	5.666667				
8	44	7.333333				
9	29	4.833333	40.65217	6.775362	10.56413	1.760688
10	61	10.16667				
11	25	4.166667				
12	44	7.333333				
13	43	7.166667				
14	45	7.5				
15	42	7				
16	40	6.666667				
17	58	9.666667				
18	29	4.833333				
19	39	6.5				
20	32	5.333333				

21	51	8.5
22	31	5.166667
23	52	8.666667

Table 3. Velocity data collected from various sprints Based on the velocity data described in Table 3, a bar chart representation of the sprint velocity for last 23 sprints is depicted by the Figure 4

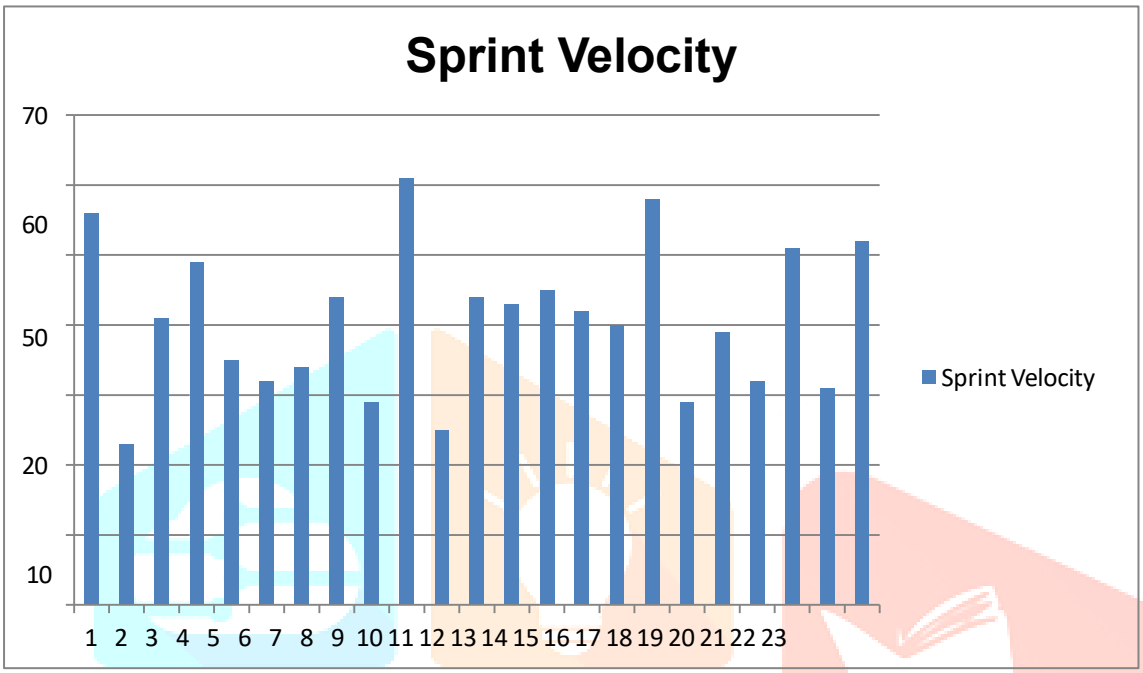

Figure 4. Bar chart representation of the team velocity-related data

As seen from the data in Table 3, the average team velocity for the applications development team using the scrum methodology is 40.65 with a standard deviation of 10.56. The data also indicates that for the majority of sprints, sprint velocity is within the range of one standard deviation from the mean value.

In addition, the average sprint velocity per team member is 6.77 with a standard deviation value of 1.76. This data will help the researcher in comparing the current team velocity with the team velocity once the new process model is pilot-tested.

6. CONCLUSION

It is concluded that scrum has the positive impact on the knowledge areas of software project management. Scrum has positive influence on the time, cost, scope, Quality, Risk and scope of the project. sprint retrospectives indicates that team's new process has provided the needed flexibility to the product owners and hence enhance the time to market of new features. And at the same time, team has the flexibility to handle urgent customer requirements within a sprint. Further, work flow across the different stages has improved, and team is managing the bottlenecks and collaborating better based on explicit rules and policies. Scrum ceremonies such as sprint retrospectives were used effectively to improve the scrumban process further, and outcome was often a small set of prioritized action points. Overall, the output of team has changed little as far as Average Velocity per team member is considered. Average Velocity per team member has increased from 6.77 to 7.0, which is just a marginal increase of 1.76%. Further, the positive feedback of the new process based on retrospective data of piloted sprints indicates that new process has added flexibility, simplified the planning, improved team collaboration, made work flow smoother, and addressed many other issues found in the current state analysis of this study.

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