

Defect Prediction in Agile Software Development

Rahul Agarwal, Avinash Patyal, Akshay Nindraojog

Abstract— Software Quality is synonymous with Defect Density. There is always a speculation as to whether the defects can be linked to the volume of development work done by Scrum teams. This paper does a scientific analysis of the quantum of work and the defects logged at various stages by multiple scrum teams to arrive upon a conclusion substantiated by data collected across six months comprising twelve sprints (each sprint being fifteen calendar days long)

Index Terms— Agile Software Development (ASD), Cross Functional Team (CFT), Business Analyst (BA), Definition of Done (DoD)

1 INTRODUCTION

There can be various categories of defects in Agile Software Development (ASD)- Defects found by Factory teams, Defects found by Integration testing team, Defects found by Customer during User acceptance testing and Production defects, in that order. It's a well-known fact that the cost of fixing a defect is directly proportional to the stage in which a defect is found- defects found later are much more costly to fix than the defects found in the initial stages of development. Authors, from this research, endeavor to perform a scientific analysis of reported defects and arrive upon a conclusion which could help Scrum Masters and other key stakeholders plan earnestly for development as well as testing resources at early stages of the project.

A typical Sprint cycle constitutes of developed and tested delivery at the end of every 15 days. The scrum team testers are supposed to test basis the Definition of Done (DoD) which is usually contractually mandated and ensures right delivery quality. During Agile development scrum testers continually log defects highlighting the severity. All Severity 1 and Severity 2 defects have to be fixed by the scrum teams before any release though delivery is possible with capped Severity 3, 4 and 5 defects.

2 RESEACRH DESIGN

In this study number of defects logged by Factory teams as well as Customer QA team have been analyzed on parameters as given below-

- Sprint-wise weighted defects
- Component-wise weighted defects
- Delivered Story Points (both Sprint-wise and Module/Component-wise)
- Delivered Story Count (both Sprint-wise and Module/Component-wise)

Defects logged in 12 Sprint cycles have been taken into con-

sideration. Correlation between Number of Story Points/Count of Stories & Number of defects has been computed to find out if a correlation exists between Stories/Story Points & actual defect raised.

3 EMPIRICAL RESULTS AND DISCUSSION

Results from SPSS breaks a common myth around positive correlation between number of Story Points and number of defects

Result 1- Correlation between Story Points & Number of Defects

| | | Storypoints | numberofdefects |
|-----------------|---------------------|-------------|-----------------|
| Storypoints | Pearson Correlation | 1 | -0.029 |
| | Sig. (2-tailed) | | 0.923 |
| | N | 14 | 14 |
| numberofdefects | Pearson Correlation | -0.03 | 1 |
| | Sig. (2-tailed) | 0.923 | |
| | N | 14 | 14 |

Pearson's correlation of -0.029 demonstrates that

1. There is a negative correlation between Number of Story points worked upon by Scrum teams and the defects found for that work. We could conclude that when the number of Story Points increase the number of defects decrease
2. There is a weak relationship between Number of Story Points and Number of Defects

Sig (2-tailed) value of 0.923 being higher than 0.05 signifies that there is no statistically significant correlation between Number of Story Points and number of Defects. Thus increase or decrease in Story Point do not significantly relate to increases or decreases in number of defects.

• Author (Rahul Agarwal) is currently pursuing Ph.D. in Management from Amity University, India. E-mail: rahul1agarwal@gmail.com
• Co-Authors Avinash Patyal and Akshay Nindraojog are author's colleagues at NIIT Technologies, India

Result 2- Correlation between Story Points & Defects Weightage

| | | Storypoints | Defectweightage |
|-----------------|---------------------|-------------|-----------------|
| Storypoints | Pearson Correlation | 1 | -0.199 |
| | Sig. (2-tailed) | | 0.495 |
| | N | 14 | 14 |
| Defectweightage | Pearson Correlation | -0.2 | 1 |
| | Sig. (2-tailed) | 0.495 | |
| | N | 14 | 14 |

Pearson's correlation of -0.199 demonstrates that

1. There is a negative correlation between Number of Story points worked upon by Scrum teams and the Defect weightage for that work.
2. There is a weak relationship between Number of Story Points and Defects weightage

Sig (2-tailed) value of 0.495 being higher than 0.05 signifies that there is no statistically significant correlation between Number of Story Points and Defects weightage. Thus increase or decrease in Story Point do not significantly relate to increases or decreases in defects weightage.

Result 3- Correlation between Number of Defects & Number of Stories

| | | Numberofdefects | Storiesper-sprint |
|------------------|---------------------|-----------------|-------------------|
| numberofdefects | Pearson Correlation | 1 | -0.06 |
| | Sig. (2-tailed) | | 0.837 |
| | N | 14 | 14 |
| Storiespersprint | Pearson Correlation | -0.06 | 1 |
| | Sig. (2-tailed) | 0.837 | |
| | N | 14 | 14 |

Pearson's correlation of -0.060 demonstrates that

1. There is a negative correlation between Number of Stories worked upon by Scrum teams and the defects found for that work. We could conclude that when the number of Stories increase the number of defects would decrease

2. There is a weak relationship between Number of Stories and Number of Defects

Sig (2-tailed) value of 0.837 being higher than 0.05 signifies that there is no statistically significant correlation between Number of Stories and number of Defects. Thus increase or decrease in Stories do not significantly relate to increases or decreases in number of defects.

4 MANAGERIAL IMPLICATIONS OF FINDINGS

Agile Software Development is all about empowerment of teams. The results of this research aid managers/scrum masters plan for work allocation of scrum teams basis the capability of a scrum team and not necessarily worrying about the number of defects should a scrum team takes up more number of stories.

5 CONCLUSION

With a comprehensive SPSS analysis it can be safely concluded that the amount of development work done by teams (for one project or program) will not necessarily lead to a proportionate rise in the number of defects. In fact, defects will be on a downward trend as development progresses.

There can be various reasons attributable to the above conclusion. Some of them are as below-

1. Teams gain functional as well as technical expertise as they continue to work on the project
2. There is better story grooming done by Cross Functional Team members along with the Business Analysts thus facilitating impediment free development

This research would enable teams take on the maximum possible stories/work without being overly concerned about the defects that might be injected because of more work.

6 LIMITATIONS AND SCOPE FOR FUTURE RESEARCHERS

This paper is limited to Agile Software development. Its findings will not hold good for waterfall methodology. Future research can be aimed at figuring out the real factors which cause an increase in the number of defects.

ACKNOWLEDGMENT

We would like to extend our warm Thanks to Dr. Anurupa Singh, Head of Department, Marketing and Retail, Amity Business School for her guidance and support

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