

COMPARATIVE ANALYSIS OF AGILE PRACTICES: XP VS SCRUM

¹SABIA SALMAN, ²BUSHRA NISAR, ³HUMAIRA ASHRAF

^{1,2,3}International Islamic University Islamabad, Pakistan.

Email: ¹sabiasulman64@yahoo.com, ²bushra.rajput2011@gmail.com, ³humaira.ashraf@iiu.edu.pk

ABSTARCT

Most of the organizations move towards agile processes, in order to take advantage from them, to produce quality software and higher customer satisfaction. SCRUM and Xtreme Programming (XP) are most popular agile methodologies. Both have their own merits and demerits. Therefore, a comparative analysis is conducted on the basis of survey held in Islamabad, Pakistan. The survey results express high adaptation of SCRUM in present days in Pakistan as compared to XP.

Keywords: agile methodology; agile software development; SCRUM; XP; agile manifesto; Xtreme Programming;

1. INTRODUCTION

Software industry is progressing rapidly and it is facing challenges in its way as well. Agile Software Development (ASD) approaches have turned out to be more well-known during the most recent couple of years. Agile SDLC model is a combination of iterative and incremental process models. Agile offers flexibility to accommodate new changes during development process and focuses on rapid development [1]. A few strategies have been created with the plan to have the capacity to deliver software faster and to guarantee that the product meets client's evolving needs. This is valid for Agile Methods also. Specifically, a few agile practices manage requirements keeping in mind the end goal to execute them effectively and fulfill the requirements of the client. ASD emphasizes on hurried iterations, small and frequent releases, and changing requirements facilitated through user involvement in the development process. Due to ever increasing software complexity and dynamic user requirements, the software industry has moved from conventional software development models to ASD [2]. Extreme Programming (XP), SCRUM, Feature-Driven Development (FDD), Adaptive Software development, Dynamic System Development method (DSDM) are few agile methods [3]. These various software development methodologies exercise the same set of agile principles formulated by Agile Manifesto, but they vary on several parameters amongst each other [2, 4].

A comparative study on SCRUM and XP is conducted in this research on the basis of existing literature. Furthermore, a survey is conducted to compare SCRUM and XP in Pakistan. Islamabad and Rawalpindi based six companies participated in the survey.

2. LITERATURE REVIEW

The research in [5] presented that ASD methodologies are becoming more popular in industry and very little is understood about their dispersion, benefits and difficulties. The attempt to make sense out of the jungle of emerged ASD methods is made. The approach chosen for the purpose was that of an empirical study conducted at Microsoft to learn about ASD and its perception by people in development, testing, and management. According to statistics, SCRUM ASD methodology is highly used among all other methodologies. To condense main outcomes, around one-third of respondents are using ASD methodologies in some form. Out of 14 ASD practices, 60% of respondents used 12 or more of them. Test-driven development and pair programming are least used practices.

Research in [6] stated that ASD has been adopted widely and it became a trend, so, refined clarity of what is Agile and what is a high-level of Agile maturity was needed. Paper dealt with Lean, Agile, SCRUM, XP and Agile Unified Process methodology emphasizing the variance between traditional waterfall and new slant in software development. Agile is implemented in organization and evaluation was performed. Overall 8% improvement was seen across all nodes put together. Author's future work would target other software teams who were adopting Agile practices and who need direction and sustenance.

Researchers in [2] conducted an Empirical Study of ASD Methodologies (SCRUM, XP and Kanban). A mix of telephonic and email conversations were conducted with the representatives of 15 software development companies. The outcomes revealed that 10 companies were following SCRUM based development, other 3 supported XP

approach and the remaining 2 companies have adopted Kanban approach to software development.

The research in [7] described qualities and shortcomings of agile SCRUM framework using knowledge management. This research paper disclosed that how to evaluate the ASD methodology, making assessment matrix, assessing the qualities and shortcomings. Here, this paper considered the SCRUM and assessed qualities and shortcomings. Author plainly recommended the method for recognizing the shortcomings; pick the best practices (RUP, SSM) which can overcome and suits to the present methodology. Evaluation matrix is used as a methodology to evaluate strengths and weaknesses of SCRUM using Knowledge Management. At last, it talked about consolidating the best practices to reinforce the existed strategy in legitimate phases by defeating its impediments.

The research in [8] attempted to show and highlight the quality and shortcoming of agile methodologies. This paper showed principle quality purposes of agile methodologies, for example, its philosophy based on short development cycle, high customer satisfaction and a fast adjustment to change. Also, how agile methodologies react to change in business sectors and numerous associations discover these techniques there is a quality point which might be changed over to shortcoming under a few circumstances, such as would be appropriateness on the target of layout the likenesses and distinction between the two techniques and the new method is suggested to deal the fields time and size of organization merging XP and SCRUM.

The researchers in [4] displayed an audit of thirty papers that were based on ASD methodologies including XP, SCRUM, Crystal, Lean Software Development (LSD), Kanban Software Development (KSD), FDD, Adaptive Software Development and DSDM, portrayed the contrasts amongst them and prescribed when to utilize them. This research additionally depicted what are challenges confronted to develop software in object-oriented software development. ASD methodologies must be connected keeping in mind the end goal to conquer these issues.

The research in [9] portrayed that ASD process had turned out to be well known in enterprises and substituting the customary techniques for programming advancement. One famous approach of ascertaining exertion of agile projects numerically was the Story Point Approach (SPA). An exertion had been made to upgrade the expectation precision of agile software effort estimation process utilizing SPA. For it, distinctive sorts of neural systems General Regression Neural Network (GRNN), Probabilistic Neural Network (PNN), Group Method of Data Handling (GMDH) Polynomial Neural Network and Cascade-Correlation Neural Network were utilized. The researchers in [10] stated a key cause for the fame of agile and lean software methods. It added to the technical debt discussion by viewing variances in expected and shown technical debt knowledge. Moreover, modules closest to execution and its maintenance were supposed to have the most optimistic effects on technical debt management.

The research in [11] investigated the extent of adoption of agile practices with regard to the Indian IT Industry. A web-based survey was held concentrating on five chief areas affecting to adoption, self-organization, effect of agile, application domain of agile approaches and the interaction of stakeholders. It is concluded that adoption of agile approaches affects the cost and increases the productivity. The research in [7] reviewed various agile approaches, their features, values, their variances w.r.t conventional process methods, merits and demerits of using agile methodology. Although most of the projects require agility but developing a more agile process for any project needs an understanding of the accumulations of these projects.

The research study in [12] compared agile methods: XP, SCRUM, FDD, DSDM, ASD with the aim to find out relationship among them to benefit future developers to select the correct methodology. Data is collected from five IT companies using personal interviewing survey and the statistical analysis is performed to find out the affiliations among methodologies and their practices. It is concluded that five agile methodologies SCRUM, XP, ASD, FDD and DSDM are well-matched to each other. All other methods favor XP in amalgamation. XP provides many suitable practices.

The discoveries of the eighth Annual State of Agile Development Survey [13] directed by Versionone.com in 2013 reason that 92% of respondents trust that agile approach helps them in overseeing changing customer requirements; 87% of them concur that agile approach enhances their team's efficiency while 70% trust that agile methodology quickens the software development process. Moreover, the survey shows an unmistakable pattern towards the higher selection of SCRUM-based approaches with 73% of respondents honing SCRUM and SCRUM variations for software development.

The research survey in [14] uncovers that 80% of the respondents concurred operating Agile approaches for software improvement. It is depicted that the study presumes that 92% of the respondents take after Scrum and Extreme Programming (XP) while 30% take after Kanban.

3. AGILE

It is sated in [15] that agile methodology was first introduced in the form of SCRUM, Crystal and XP. Due to incremental and iterative nature agile development is widely used in a software development organization where the requirements are not stable. With the ability to respond changes.

a. SCRUM

SCRUM is the most prevalent agile framework, SCRUM uses iterative and incremental approach for development [16]. SCRUM focuses on performing development tasks in a team-based domain. Completion of work is the responsibility of the team [3, 17]. Team includes a mix of software engineers, architects, programmers, analysts, QA experts, testers, and UI designers for software projects [18]. SCRUM methodology welcomes requirement change and it assists in developing a project with better communication and collaboration among team members and release software in sprints [11, 16, 18]. SCRUM increases the capacity of the development team to quickly deliver by accommodating new and changed requirements [15]. Requirements are dealt through user stories and discussion of user stories defines actual requirements [19]. The requirements are documented by the product owner (client representative) who is also responsible for understanding the system and its business rules [20]. SCRUM iteration is of 2 to 4 weeks. SCRUM welcomes changes [16].

b. XP

XP is the most popular approach in agile development to arrange people to produce quality software more productively and efficiently. XP focuses on perpetual reviews, pair programming, testing activities and code refactoring activities [17]. Pair programming is highly encouraged in XP because it results in collaboration [21]. In pair programming, two persons (driver and watcher) work at the same time and roles are exchanged regularly, hence favoring the collective ownership [22]. In Pair Programming, code is written by a pair of programmers working at the same machine [18]. In XP, requirements are collected via user stories (story cards) and onsite customer [19]. XP focuses on successful software development in spite of ambiguous and changing software requirements [5]. XP is dependent on many new technologies such as having the customer at the same location as the development team, pair programming and collective code ownership [3, 11]. XP team has to work 40-Horurs a week, reducing overtime. XP encourages the practices of Refactoring (continuous improvement of the software design), Pair programming, Test Driven Development and User Acceptance Test (UAT) [2, 18].

4. SCRUM VS XP

Mostly, in SCRUM requirements are collected and managed by product owner in the form of product backlog whereas in XP, requirements are collected via story cards by the customer, which are further translated into specific requirements. SCRUM doesn't allow requirement change within the sprint whereas XP welcomes change at any point in the development. SCRUM iteration is longer than XP, SCRUM takes from 2 to 4 weeks, whereas XP takes two weeks normally, and in some cases 1 to 6 weeks. XP is favored for small organizations and short projects required to be done within shorter time, whereas SCRUM is given preference for large organizations which require longer time [16]. XP encourages the practice of pair programming which results in increased knowledge distribution, the production of better quality code, enhanced communication and reduction in working hours and workload. In SCRUM, work is done by the whole team, one has to be jack of all trades while working in SCRUM environment; SCRUM focuses on performing development tasks in a team-based domain.

The survey is held as a methodology to compare XP and SCRUM on the basis of aforementioned parameters. Questionnaire technique is used to collect the data. The Islamabad based companies: Pakistan Agricultural Research Center, SINA Institute of network and Aesthetic, Bentley, Ciklum, Seven Software Development and Viztek Solution are involved in filling the questionnaires for this survey.

5. RESULTS

5.1 Mostly used development methodology

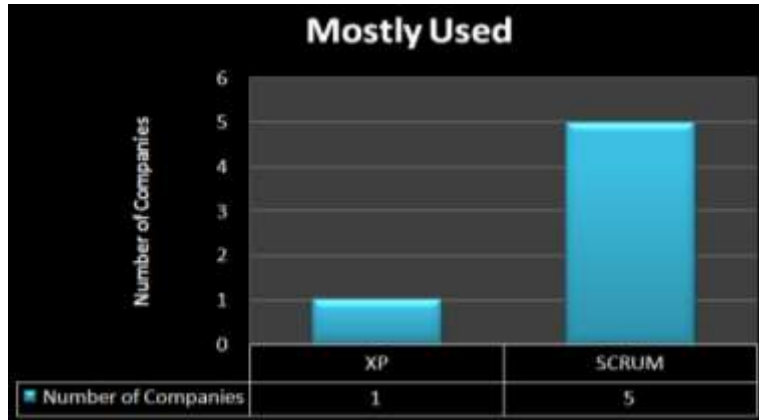


Figure. 1 Mostly used development methodology

Table. 1 Mostly used development methodology

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	XP	1	16.7	16.7
d	SCRUM	5	83.3	100.0
M				
	Total	6	100.0	

As per the results of the survey shown in Table 1, 5 out of 6 companies were found to be following SCRUM based development methodology, while 1 of them expressed its faith in XP methodology.

5.2 Requirement management



Figure. 2 Requirement management

Table. 2 Requirement management

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Managed in form of artifacts through sprint backlog and product backlog	5	83.3	83.3	83.3
	Managed in form of story cards	1	16.7	16.7	100.0
	Total	6	100.0	100.0	

Results shown in Table 2 reflect that out of 6, 1 company was managing requirements in the form of story cards, whereas 5 companies were managing requirements in the form of artifacts through sprint backlog and product backlog.

5.3 Design complexity

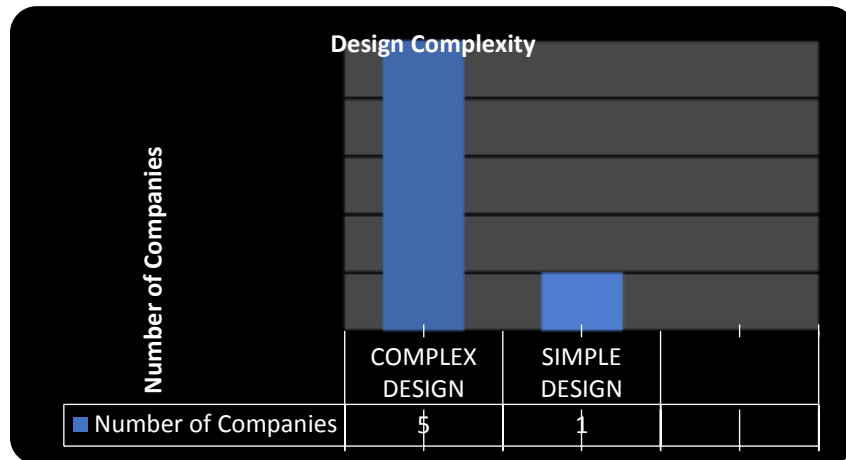


Figure. 3 Design complexity

Figure 3 shows that SCRUM follows complex design approach thus, 5 companies were following complex design and 1 was having simple design approach.

5.4 Mostly used techniques in SCRUM and XP

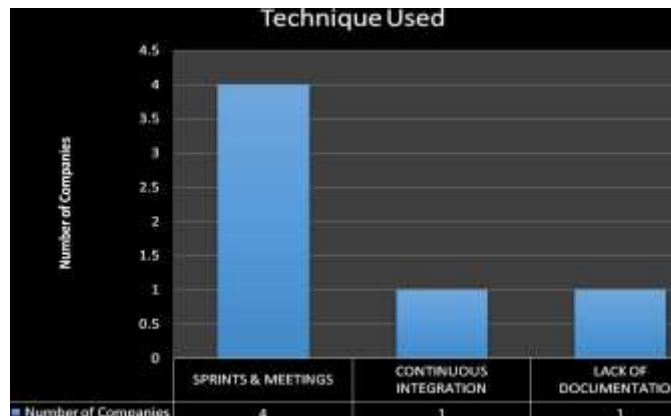


Figure. 4 Mostly used techniques in SCRUM and XP

Figure 4 shows the mostly used techniques in SCRUM and XP that were investigated and it is found that 4 companies were following sprints and meeting techniques more frequently, whereas 1 was having continuous approach and 1 favored the lack of documentation.

5.5 Nature of customer interaction

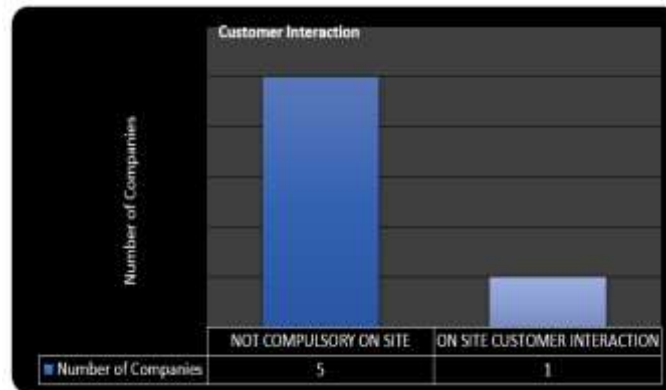


Figure. 5 Nature of customer interaction

Figure 5 shows that companies using Scrum don't demand customer to be on site whereas XP demands the opposite. 5 companies using Scrum demanded their customer not to be on site whereas 1 did so.

5.6 Distributed tool being used in companies

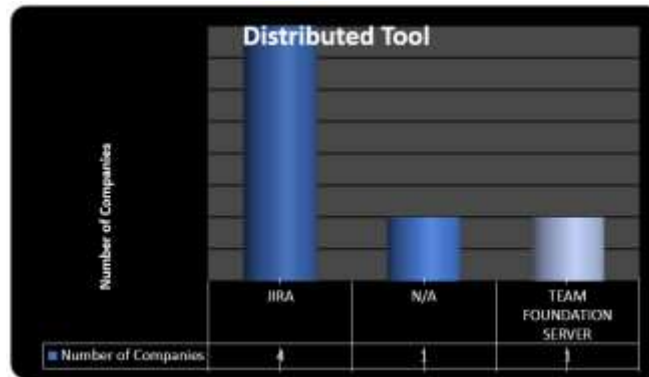


Figure. 6 Distributed tools

Figure 6 shows that 4 companies were found with the usage of JIRA as distributed Environment tool, one went with Team Foundation Server, and 1 company was not having distributed environment for their work force management.

6. CONCLUSION

In the present scenarios software industry highly prefers the usage of ASD. Different agile methodologies are adopted by different software companies for different projects in order to develop highly reliable software within short time span. In this research, a survey is conducted to evaluate the usage of ASD methodologies in software companies of Pakistan. The current research survey favored the usage of SCRUM than XP in Pakistani software companies. Software development methodologies are beneficial in their own way but these results depict that agile practices like SCURM and XP help in developing more robust software applications under controlled environment. The iteration process helps in improving different paradigms in the industry that helps in making industrial process more mature and adoptable. The deduced results from the real time survey of the software companies operating in Islamabad show

that SCRUM is more flexible than XP. Thus, SCRUM is having major share in software market as compared to XP.

ACKNOWLEDGEMENT

Authors are thankful to International Islamic University Islamabad, Pakistan for providing resources in order to complete this research. Special thanks to all those who have supported us in the completion of this research. Moreover, special thanks to reviewers for their valuable suggestions in order to improve this research paper.

REFERENCES

1. Pawar, R.P., *A comparative study of agile software development methodology and traditional waterfall model*. IOSR Journal of Computer Engineering (IOSR-JCE), 2015. 2(2): p. 1-8.
2. Matharu, G.S., et al., *Empirical study of agile software development methodologies: A comparative analysis*. ACM SIGSOFT Software Engineering Notes, 2015. 40(1): p. 1-6.
3. Tri, H., et al. *Progress of agile movements in Australia: Propose a Universal Dynamic System Development Method (UDSDM) and universal framework*. in *2016 7th International Conference on Information and Communication Systems (ICICS)*, . 2016: IEEE.
4. Karambiri, A.S., *A REVIEW OF AGILE METHODOLOGY IN SOFTWARE DEVELOPMENT*. methods, 2016. 3(03).
5. Choudhary, B. and S.K. Rakesh. *An approach using agile method for software development*. in *2016 International Conference on Innovation and Challenges in Cyber Security (ICICCS-INBUSH)*, . 2016: IEEE.
6. Duka, D. *Adoption of agile methodology in software development*. in *2013 36th International Convention on Information & Communication Technology Electronics & Microelectronics (MIPRO)*, . 2013: IEEE.
7. Morampudi, N.S. and G. Raj, *Evaluating strengths and weaknesses of agile scrum framework using knowledge management*. International journal of computer applications, 2013. 65(23).
8. Mohammad, A.H. and T. Alwada'n, *Agile software methodologies: Strength and weakness*. International Journal of Engineering Science and Technology, 2013. 5(3): p. 455.
9. Panda, A., S.M. Satapathy, and S.K. Rath, *Empirical validation of neural network models for agile software effort estimation based on story points*. Procedia Computer Science, 2015. 57: p. 772-781.
10. Holvitie, J., V. Leppänen, and S. Hyrynsalmi. *Technical debt and the effect of agile software development practices on it-an industry practitioner survey*. in *2014 Sixth International Workshop on Managing Technical Debt (MTD)*, . 2014: IEEE.
11. Nazir, N., N. Hasteer, and A. Bansal. *A survey on agile practices in the Indian IT industry*. in *2016 6th International Conference on Cloud System and Big Data Engineering (Confluence)*, . 2016: IEEE.
12. Shelly, *Comparative Analysis of Different Agile Methodologies*. International Journal of Computer Science and Information Technology Research, 2015. 3(1): p. 199-203.
13. Version, O., *The 8th Annual "State of Agile" Survey*. 2014. p. 1-14.
14. Xebia, *Agile Survey*. 2013.
15. Campbell, J., et al. *Scrum and agile methods in software engineering courses*. in *Proceedings of the 47th ACM Technical Symposium on Computing Science Education*. 2016: ACM.
16. Almseidin, M., et al., *A comparative study of agile methods: XP versus SCRUM*. International Journal of Computer Science and Software Engineering (IJCSSE), 2015. 4(5): p. 126-129.
17. Malhotra, R. and A. Chug. *Comparative analysis of agile methods and iterative enhancement model in assessment of software maintenance*. in *2016 3rd International Conference on Computing for Sustainable Global Development (INDIACom)*, . 2016: IEEE.
18. Khairi, A.M.M., M.Z. Kamaruddin, and S. Widyarto. *Agile Methodology Software Development: A Brief Review*. in *Proceedings of the Informatics Conference*. 2016.
19. Baruah, N., *Requirement management in agile software environment*. Procedia Computer Science, 2015. 62: p. 81-83.
20. Maria, R.E., L.A. Rodrigues Jr, and N.A. Pinto. *ScrumS: a model for safe agile development*. in *Proceedings of the 7th International Conference on Management of computational and collective intelligence in Digital EcoSystems*. 2015: ACM.
21. Plonka, L., et al., *Knowledge transfer in pair programming: An in-depth analysis*. International journal of human-computer studies, 2015. 73: p. 66-78.

22. Seyam, M. and D.S. McCrickard. *Teaching Mobile Development with Pair Programming*. in *Proceedings of the 47th ACM Technical Symposium on Computing Science Education*. 2016: ACM.

AUTHORS PROFILE