XSR: Novel Hybrid Software Development Model (Integrating XP, Scrum & RUP)

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Abstract— Software industries are progressively adopting the agile development practices of customized models such as Extreme Programming (XP) or Scrum or Rational Unified Process (RUP). Scrum and Extreme Programming (XP) are frequently used agile models, whereas Rational Unified Process (RUP) is one popular classic plan driven software development methodology. Both agile and plan driven models have their own merits & demerits such as XP has good engineering practices, team collaboration and on the other hand weak documentation, poor performance in medium & large scale projects. Scrum is based on project management practices. RUP model has some limitations such as impractical for small and fast paced projects, tendency to be over budgeted, condemn rapid changes in requirements. This research paper based on propose novel hybrid framework XSR by combining strengths of Scrum, XP and RUP by suppressing their limitations to produce high quality software.

Index Terms— eXtreme Programming (XP), Scrum, Rational Unified Process (RUP), XP Scrum RUP (XSR)

I. INTRODUCTION

Extreme Programming (XP) is the most highly adopted agile practice and widely used in various organizations and software industry throughout the world. XP is simple & lightweight agile methodology for small scale & simple projects. XP believe on basic five working codes/values are communication, simplicity, feedback, courage and respect. XP is designed for small teams who need to work in a fast & quick software development environment, where requirements are changing frequently & exceptionally. XP works by bringing the whole team together in the presence of simple practices, with continuous feedback to enable the project team to see their position. XP is resource oriented rather than process centric. Its follows an iterative and incremental approach; highly focusing on regular customer collaboration, embracing changes anytime, anywhere. Releases are delivered via small iterations, minimum error level. It's also prioritizing the project artifacts and work on the task with high level priority. Handling the rapidly changing business requirements is main capability of XP. Due to direct customer involvement by giving constant feedback, XP has a positive impact on the business requirements, which producing high quality software

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according to customer desires. XP main strengths are include rapid development, low cost, high quality, result oriented development, small bug rates and embracing of rapid changes at any stage with minimum possible expenses. Common XP practices are include Planning Game, Small Releases, Metaphor, Simple Design, Tests, Refactoring, Pair Programming, Collective Ownership, Continuous Integration, 40-hour Week On-site customer and Coding Standards [1][2][3][4][5][6][21][24].

Scrum is a popular and widely adopted agile software development technique/model. Scrum is focus on project leadership and some aspects of requirements management, which is derived from best business practices in terms of productivity and quality. Scrum is a lightweight framework and is suitable to integrate with other iterative incremental models work on complicated projects. Scrum also has the ability to promote the existing business practices, which increase the quality as well as productivity of the projects. The iteration in Scrum is called sprint, which is more suitable for distributed teams of project initialization. Sprint is (2-6 week) time boxed or iterations. In some projects requirements are unclear & ambiguous in this situation Scrum development methodology is the best practice. Scrum speeding up development, objectives alignment, creative business culture, promote share-holder value & promoting individual improvement. Scrum helps to a software providers & vendors to compete with others to achieve the market value. The main objective of Scrum development to manage the development processes of system with such practice to deliver high quality software. Scrum promoting self-organizing teams and helps to provide productive flexible working environment. It is an incremental and iterative process technique that conducting continuous communication meetings which are highlighting the overlapping areas, module integration & data validation. The sprint or time box length in scrum usually from two to four weeks which can helps to finish the project within few months [3][7][8][9][10][20][23].

The Rational Unified Process (RUP) is an incremental, iterative and plan oriented architectural framework, focusing on standard software engineering principles. It is a step by step process methodology to promote qualitative object oriented software projects. RUP is a conventional & plan driven approach, which provides a very clear structured and formalized flow for software development. RUP based on planning centric process, extensive system analysis, proper design principles, standard coding process and extended level of documentation. RUP are suitable for large scale projects due to extensive documentation, case driven, predictability, best assurance, tailoring and tool support processing. RUP can also be customized and tailored

according to business requirements in mid-level projects [11][12][20][21].

The core idea behind this study is to propose a hybrid model (XSR) to combine the best practices & depressed limitations of existing agile models (XP, Scrum & RUP) to increase the capability of software industry to produce high quality in the software projects on time and within budget. XSR (XP, Scrum & RUP) model is to develop integration among eXtreme Programming (XP), Scrum & Rational Unified Process (RUP), while the focus of XP to provide very effective engineering practices, Scrum main goal to provide effective framework for management of the project and Rational Unified Process (RUP) is a conventional model, which believe on documentation and plan oriented. This integrated hybrid model of XP, Scrum and RUP will combine their best practices to achieve the goal of satisfying business and customer needs. The resultant outcome of this integration will be a rich productive and an efficient model i.e., XSR that having best engineering & management practices of software engineering and more productive [13][14][15][22][25].

The proposed novice hybrid model i.e. XSR will be the collaborative container for combining the best practices and strengths of XP, Scrum and RUP, such as XP providing the best software engineering practices, Scrum offering a best project management features and RUP directions are business objectives accomplishment and customer satisfactions. The proposed hybrid model is to combine the good features of XP, Scrum and RUP and to decrease their pitfalls to provide a qualitative software development model to ensure business needs and embrace changes smartly. XSR (XP, Scrum and RUP) is intended to embed the management features from Scrum, coding and standard strengths from XP and business objective accomplishment & customer satisfactions from RUP. The main logic behind creating XSR model is to have a development methodology that has the capabilities to produce high quality products and low bug rate [14][25]. This paper is organized as follows: section 2 will discuss, why do we need hybrid model XSR? Section 3 will explore proposed hybrid model XSR; and finally section 4 will conclude with discussion along with future direction.

II. WHY DO WE NEED XSR?

Different agile models are experienced and practiced by integrating them with plan driven conventional software development models to increase the throughputs of both agile and classic models, while trying to suppress the pitfalls and limitations of each approach. Integration of Scrum, XP and RUP methodologies is a good combination to enrich the practices of both pompous and agile approaches. XP focus on engineering practices & coding standards, but lacks in project management expertise; XP practices can apply in small projects due fully dependent on customer, which increase the project fail risks. On the other hand Scrum is focusing on project management practices and silent about the software engineering processes. Scrum required sound technical qualified resources to build the team. RUP model also ringing some risks & limitations, such as over budgeting, rapid changes of requirements are getting slow

response, suitable only for medium & large scale projects rather than for fast paced and small scale projects. RUP model major pitfalls are that they are not providing proper guidelines for implementation of projects and leaving entirely on the user end. The best practices of Scrum and XP are to embrace rapid changes in requirements intended to add into XSR model, while RUP getting fail in adaptation to frequent changes in requirements due to based on extensive system requirements documentation. The primary potency of RUP model is to meet business requirements & customer satisfaction by delivering software with high quality and providing adequate planning of the system. Considering the context about XP, Scrum and RUP model, the research problem becomes "Need to propose a hybrid model by integrating the strengths of XP, Scrum & RUP as well as narrower the flaws to build a quality software development model to adapt creeping requirements quickly with planning & documentation" [13][15][16][3][22].

XSR is not a methodology, but it is generalized framework from which anyone can choose interested ideas, which might suitable for various organization or project [14]. XSR also has some extra structure that is not in some of agile models. Some interested points that trying to proof that framework is worthy: [18]

- XSR is an integrated framework of chairing agile models, combining together a set of gratuitous strengths such as Scrum, XP & the Unified Process.
- Existing agile models are mostly lacking of having practices about the full life cycle. For instance Scrum main focus on management oriented, rather than architecture centric. XSR is a hybrid framework gleans heading strengths from full lifecycle.
- XSR a detonated recognition that mostly all enterprise level projects go through startup and deployment phases, which inception & transition phases respectively.
- XSR believed on unbranded nomenclature such as "sprint" rather recommending common language words that is easy to understand instead of sticking with one's methodology preferences.

XSR is not means to replace any existing agile practice but to simplify & promote them. Instead of saying that "I am working on project using Scrum, somehow XP, somewhere RUP practices etc.", simply can say that we are using the XSR framework. For instance, if a team now doing Scrum, they could still say that they are following the XSR framework. Using agile capabilities one can crazy about speedup or quality, or about additional scaling process; XSR could help in these ideas, but only that it makes sense for project. In abstract, XSR provides a comprehensive guidance with unbranded ideas that go beyond traditional agile models that help organization to deal enterprise in informal projects [18].

III. PROPOSED HYBRID SOFTWARE DEVELOPMENT MODEL XSR

As described above agile practices are not well tested for large scale projects, but analysts are claiming that complex & large size project can take advantages of them. To overcome this issue it is to build a hybrid model by combining leading agile methodologies, such as XP, Scrum and RUP. The XSR

hybrid framework support to and extended the disciplines and principles of the agile manifesto. Project teams that are using iterative or incremental or agile processes have to produce high quality software, with higher return on investment (ROI), stakeholder satisfaction, and rapid deliver as compared to a conventional process model or an ad-hoc approach. By using some techniques such as refactoring, continuous integration (CI), test-first development (TFD), and developer regression testing (DRT) high quality can achieve. Return on investment could increase by focusing primary value activities with prioritize order, self management, automation of regular activities, close collaboration etc. [14][18]. XSR is the conceptualize model of many techniques and principles from the three most popular agile methodologies i.e. XP, Scrum & RUP. Mostly XSR practices are taken from the agile community, such as daily meetings, continuous integration (CI), and refactoring. The XSR is hybrid process model/framework, which could adopt and tailors techniques & practices from a different of sources. The XSR model/framework is integrated form of the below methods: [18]

A. Extreme Programming

XSR inherited the strategies of XP, but not limited collective ownership code, refactoring, TDD (test driven development), CI (continuous configuration), and others.

B. Scrum

Scrum primary focus is on management of requirements, guidelines and leadership. XSR tailors many ideal things from Scrum and ignoring many of the scrum practices as well. XSR adopting the idea of prioritize items, product ownership representative role, and a working potential deliverable is expected from each iteration; however, XSR denounce some Scrum ideas and terminologies, such as scrum master no longer in use called as product owner, no speedy sprints etc.

C. Unified Process (UP)

XSR process framework is tailoring many ideas and strategies agile unified processes such as Open Unified Process (OUP) and Agile Unified Process (AUP). These strategies include explicit phase & lightweight milestones and also inheriting the features of providing architecture and eliminating risks in initial iteration, as shown in Figure-1 below.
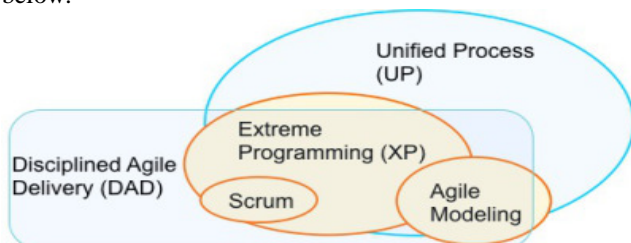

Fig. 1 Comparison of XP, Scrum & RUP in XSR

XSR provides a proper lifecycle of the project such as initialization, construction and releasing to end user. XSR is recommending that each iteration is not same, but can evolve depends on change in project requirements along the lifecycle. XSR believe in simplicity therefore distribute the project into phases, which each of them having lightweight

milestones to focus on doing rights on right time with proper direction. These phases include initial visioning, architectural modeling, risk management, and deployment planning. This life cycle has several critical features:

1) Delivery lifecycle

XSR lifecycle extends of Scrum lifecycle, which are tends to show explicitly the complete delivery lifecycle from the initialization of a project to the release into production.

2) Explicit phases

The XSR lifecycle is consist of three phases such as inception phase, construction phase, and transition phase, reflecting the agile C3 (Coordinate Collaborate Conclude) cycle, as shown in Figure-2 below. [18]
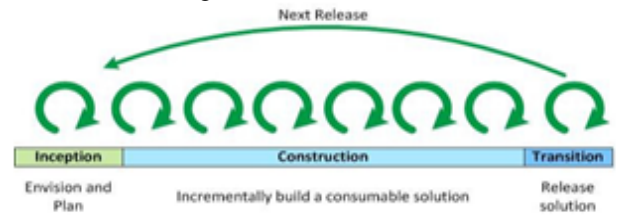

Fig. 2: XSR lifecycle

3) Explicit milestone

XSR framework contains a variety of milestones, which are playing an important role in governance and eliminating risks in projects. Let's overview the XSR phases to better understand the contents of the XSR process framework [18].

a) The Inception Phase

Plan driven models investing a big amount of effort and time to up front their projects plan. Other hand agile methodologies discouraging much up front detail, while a bit is address about the business requirements with time frame & budget constraints. Agile approaches suggest very small amount of effort and time to be invested in project upfront planning. The agile catchword can be as "let's just get started and will determine where we are going as we go". Some agile models are recommending a very short planning iteration that is called "Sprint 0" in Scrum, and the "Planning Game" in XP. Planning Game usual length is around 3.9 weeks. XSR hybrid model introducing the need trace the right direction before moving ahead such as for initialization to spent a few days and a few weeks. Table-1 shows inception phase goals.

Table-1

Inception Phase Goals
- Define the project vision
- Agreement with stakeholders according to project plan, and requirements
- Building of team
- Secure project budget
- Clear the risks
- Define technical strategy initially

b) The Construction Phase

In XSR construction phase is the timeline in which working software is built and required functionality are completed. This timeline is break up into sub timelines or time-boxes, which are called iterations. All iteration should be of same period for the same project, which is typically of 2-4 weeks duration. Output of each iteration is potential

deliverable solution with proper testing. In this phase sufficient functionality are delivered which can justify the transition cost or also called minimum marketable release (MMR) which accepted by shareholder [18]. Table-2 shows construction phase goals.

Table-2

Construction Phase Iterations Goals
- Develop a potential solution
- Focus rapid changes stakeholder requirements
- Address deployable releases
- Quality continuous improvement
- Define major risks

c) The Transition Phase

XSR model transition phase focuses on deployment & delivering the working software into marketplace. The duration for transition phase is depends on project nature & size as well the business requirements. Transition of external release is more harder then internal release. For external system high level testing are required before release to marketplace with many alpha & beta tests. The result of the end of transition phase is completely stakeholders accepted & deployed system [18]. Table-3 shows transition phase goals and Table-4 shows other ongoing goals.

Table-3

Transition Phase Goals
- Make sure the deliverable is ready for transition
-Make sure the users are ready to get the solution
-Solution deployment on production

Table-4

Other Ongoing Goals
- Complete the project mission
- Continuous growth of the team skills
- Extension of infrastructure
- Improvement of working process and environment
- Utilize the infrastructure

IV. DISCUSSION AND FUTURE WORK

This research primary aim is to get such generic software development model to develop qualitative software that should be on time, meet customer needs and boost team performance. XSR framework combining the strengths of the three popular agile models such as XP, RUP and Scrum while suppressing their pitfalls. XP will provide software engineering practices such as user stories, pair programming, and test driven activities. Scrum is popular for managerial techniques due to observations; roles based approach and artifacts throughout lifecycle of project development. RUP will help in providing structured, skeleton and formalized guidelines throughout lifecycle and also help in support of XP practices via its philosophy [1].

The proposed XSR framework also need proper testing & review like other customized agile models XP, Scrum, Lean, Kanban, and Crystal clear etc. in real practical environment to promote it. Various industries as well individual professionals are working, on that way to improve the practices of XP, Scrum and RUP to manage software development and delivery of projects. My suggestions lets help us in promoting this new hybrid framework further by

evaluating it in various sized and types of projects and organizations in different business environments. XSR practical implementation can address its shortcomings & flaws and can improve it by sharing ideas of practical experiences. Some recommendations for future work for extension of the XSR framework are: [19]

- XSR framework can be further integrated with other models and standards for getting best solution.
- More case studies & survey with agile as well business professionals involved in variety of projects and business could improve XSR framework.
- Real implementation of XSR framework could support the improvement in the hybrid model.

The real applications of XSR hybrid model would take time, because every practitioner is cautious to implement a virgin model or practice that has not proved yet. Best approaches and practices are gradually, but continuously improved by testing and evidence. The breadcrumb of the XSR framework will only be realized after more application in real environment [19].

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