AN ANALYSIS OF AGILE METHODS: XP, SCRUM AND CRYSTAL METHODS

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Abstract
Scrum, XP(Extreme Programming) and Crystal Methods are family of agile methods. Each of them have unique characteristics. This article provide an overview of the agile methods including their common and unique properties and the differences between the methods, the process, scope of use and adopting, etc. the result of the analysis is the comparison between the three of agile methods

Keywords: agile methods, XP, Scrum and Crystal Methods.

1. INTRODUCTION

Agile methods are a reaction to traditional ways of developing software and acknowledge the need for alternative to documentation driven, heavy weight software development processes [Beck, et.al.,2001].

The industry and technology move too fast, that conditions make requirements almost changing and customer have become increasingly unable to definitively state their needs, agile methods can capture the problem.

There are so many agile methods, like Scrum, XP, Crystal, Lean Development, Agile Modelling and Feature Driven Development, but in this article we just analyse and compare three of them, XP, Scrum and Crystal Methods.

According to Miller (2001) there are 9 characteristics to agile development processes from the fast delivery point of view, which allow shortening the life-cycle of the project

- Modularity on development process level.
- Iterative short cycles enabling fast verifications and correction.
- Time-bound with iteration cycles from one to six weeks.
- Parsimony in development process removes all unnecessary activities.
- Adaptive with possible emergent new risks.
- Incremental process approach that allow functioning application building in a small steps.
- Convergent (and incremental) approach minimizes the risks.
- People-oriented, i.e. agile processes favor people over processes and technology.
- Collaboration and communicative working style.

2. XP, SCRUM AND CRYSTAL METHODS

XP (Extreme Programming) introduced by Beck, Jeffries et.al., 1998 [The C3 Team, 1998].

There are 12 rules of XP :

- The Planning Game.
- Small Releases.
- Metaphor.
- Simple Design.
- Tests
- Refactoring.
- Pair Programming
- Continuous Integration
- Collective Ownership.
- On-site customer.
- 40-hours weeks
- Open Workspace

Team size of XP is 2 – 10 peoples that can fit in a single room in iteration length is 2 weeks.

XP has several artifacts such as, user stories, story card, and metaphor. User stories and story card performed in the beginning of each iteration.

Scrum first described by Ken Schwaber in 1996 as a process that accepts that the development process is unpredictable. The term borrowed from Rugby. Scrum typically has three artifacts such as product backlog, sprint backlog and burndown chart.

The key principles of Scrum [Schwaber,2002] are :

- Small working teams to maximize, minimize overhead, and maximize sharing of tacit, informal knowledge.
- Adaptability to technical or marketplace (user/customer) changes to ensure the best possible product is produced.
- Frequent builds, or construction of executable, that can be inspected, adjusted, tested, documented, and built on...
- Partitioning of work and team assignments into clean, low coupling partitions or packets.
- Constant testing and documentation of a product as it built.
- Ability to declare a product done whenever required (because the competition just shipped, because the company needs the cash, because the user/customer needs functions, because that was when it was promised.

Team size of scrum up to seven people, with iteration length is 1-6 week, durations commonly held in 4 weeks.

Crystal methods were developed by Alistair Cockburn in 1990. According to him, one of the major obstacles facing product development was poor communication. The term “crystal” represented of a gemstones, i.e. each facet is another version of process. All arranged around an identical core. The most agile version is Crystal Clear, followed by Crystal Yellow, Crystal Orange, Crystal Red, etc. The number of the Crystal you use depends on the number of people involved, which translates into a different degree of emphasis on communication.

All Crystal methods begin with a core set of roles, work products, techniques, and notation. Crystal methods accommodates any team sizes, with iteration length up to 4 months for larger project and highly critical project.

3. THE ANALYSIS
3.1 Process
3.1.1. XP
XP life-cycle consists of five phases: Exploration, Planning, Iterations to Release, Productionizing, Maintenance and Death. These phase introduced by Beck (Figure 2)

![Figure 1 Life cycle of XP Process (from VTT Publication 478)](image)

Description of each phase:
- Exploration Phase, the customers write out the story cards that they wish to be included in the first release. Each story card described the feature to be added into the program.
- Planning Phase, the priority order of the stories is set and an agreement on the content for the first release are made.
- Iteration to release phase included several iteration of the systems before the first release. Productionizing phase requires extra testing and checking of the performance of the system before the system can be released to the customer.
- Maintenance Phase requires an effort also for customer support task. The phases also may require incorporating new people into the team and changing the team structure.
- The Death phase, the customer does no longer any stories to be implemented. This requires that the system satisfies the customer needs, death may also occur if the system is not delivering the desired outcomes, or if it becomes too expensive for further development.
3.1.2 Scrum

The scrum phases are introduced according to Schwaber 1995 and Schwaber and Beedle, 2002. The pre-game phase consists of two phase, Planning and Architecture/High level Design. Planning is includes the definition of the system being developed. A product backlog list is created containing all requirement that are currently know.

In the architecture phase, the high level design of the system including the architecture is planned based on the current items in the product backlog. The development phase (game phase), the different environmental and technical variables are identified, and it may change during the process. The post-game phase contains the closure of the release. In this phase the requirements are completed there are no more item or issue can be found.

3.1.3 Crystal

All of the methodologies of the Crystal family provide guideline of policy standard, work product, "local matter", tools, standards and roles.

Crystal supports 4 basic criticalities: failure resulting in loss of comfort, discretionary money, essential money, and life.

Crystal Clear and Crystal Orange are two of the crystal family that have been constructed and used (Cockburn 1998; Cockburn 2002a).

Crystal Clear is designed for very small project, comprising up to six developers. A team using Crystal Clear should be located in a shared office-space due to it limitations in communication structure.

Crystal Orange is designed for medium size project, with a total 10 to 40 project members. the project duration of one to two years. The Crystal Orange emphasizes the importance of the time to market issues.

Figure 3 describes one increment of Crystal process.

3.2 Practices

3.2.1 XP

XP is a collection of ideas and practices drawn for already existing methodologies [Beck, 1999a]. Figure 4 describes the decision making structure, roots of Extreme Programming, in which customer makes business decisions while programmers decide on technical issues from the ideas of Alexander (1997).
XP aims at enabling successful software development despite vogue or constantly changing in requirements in small to medium sized team.

In the following, the practices of XP that are presented in the following according to Beck (1999a), such as Planning Game is close interaction between the customer and the programmers. The programmers estimate the effort needed for the implementation of the customer stories and then the customer decides about the scope and timing of releases. Small/short release, a simple system are “productionized” rapidly, at least one in every 2 to 3 months. New version are then released even daily, but at least monthly, and metaphor, the system is defined by metaphor/set of metaphor between the customer and the programmer. This shared story guides all development by describing how the system works.

3.2.2. Scrum

Scrum does not require or provide any specific development methods/processes to be used. Instead, it require certain management practices and tools in the various phase of Scrum to avoid the chaos caused by unpredictability and complexity (Schwaber, 1995)

The scrum practices are given by Schwaber and Beedle (2002), such as product backlog, effort estimation and sprint.

Product backlog defined everything that is needed in the final product based on current knowledge. Product Backlog defines the work to be done in the project. This practice includes the task for creating the product backlog list and controlling it consistently.

Effort estimation is an iterative process, in which the backlog items estimates are focused on a more accurate level when more information available in certain product backlog items.

Sprint is a procedure of adapting to the changing environmental variables. The scrum team organizes itself to produced a new executable product increment in a sprint that lasts approximately thirty calendar days. The working tools of the team are Sprint Planning Meeting, Sprint Backlog and Daily Scrum meeting.

3.2.3 Crystal Methods

Some of the practices in Crystal methods are staging, revision and review and monitoring.

Staging includes the next increment of the system. The team select the requirements to be implemented in the increment and schedules what they feel they able to deliver (Cockburn 1998)

Revision and review, each incremental includes several iterations. Each iteration consist of the following activities: construction, demonstrations and review of the objectives of the increment (Cockburn 1998)

Monitoring, the progress is monitored regarding the team deliverables during the development process with respect to their progress and stability (Cockburn 1998). The progress is measured by milestones (start, review 1, review 2, test, deliver) and stability stages (wildly fluctuating, fluctuating and stable enough to review).

3.3. Scope of use and adoption

3.3.1 XP

As stated by Beck (1998b), the XP methodology is by no means suitable everywhere, nor have all its limits yet been identified. However, some limits have been identified.

Beck (1999b) suggests the time size to be limited between three and a maximum of twenty project member. Communication and coordination between the project members should be enable in all of the time.

The business culture affecting the development unit is one issue in XP. Any resistance against XP practices and principles on behalf of the project
members, management or customer may be enough to fail the process (Beck 1998b).

Beck suggests the XP should be adoption gradually. One of the fundamental ideas of XP is that there is no process that fits every project as such, but rather practices should be tailored to sweet the needs of individual project (Beck 1999b).

3.3.2 Scrum

Scrum is a methods for small team of less than 10 engineers. The Schwaber and Beedle suggest for the team to comprises five to nine project members. If more people available, multiple team should be performed.

Since Scrum does not required any specific engineering practices, it can be adopted to manage whatever engineering practices are used in the organization (Schwaber and Beedle 2002). However, Scrum may change the job description and customs of the scrum project team considerably.

Schwaber and Beedle identified two type situations in which scrum can be adopted: an existing project and an new project. A typical case of adopting scrum in existing project is a situation where the development environment and technology to be used exist, but the project team is struggling with problem relative to changing requirement and complex technology. In the case of adopting scrum in a new project, Schwaber and Beedle suggests first working with the team and the customer for several days to build an initial Product Backlog. Product backlog may consist of business functionality and technology requirements.

3.3.3 Crystal Methods

At present, the crystal methods does not cover life critical project. Another restriction identified by Cockburn (2002a)is that only co-located teams can be addressed by these methodologies. He also identified limitations concerning the individual methodologies used in crystal family. Crystal Clear suitable only for single team, cause by the limitations of their restricted communication structure, crystal clear also does not suitable for life critical project, cause by the lack of system validation. While Crystal Orange it also lacks of system structure, it suitable for project involving up to 40 persons. It also not very competent regarding design and code verification activities and it thus not suitable for life critical project.

At least one experience report (Cockburn 1998) can be found of a project adopting, evolving and using practices that currently form the Crystal Orange methodology.

4. Result

Most agile methods typically have a less documentation, from the three of the agile methods describes in this article, That can summarize as follows:

The time size for every methods are differ, XP have team size 2-10 project members, Scrum have team size less than 10 project members. If there more project members are available, multiple team should be performed, and the crystal methods have no limitation on the team size.

Process, each agile methods have their phase of the software process, phase in the software process consist of several activities from requirement phase to the release phase. XP has more documentation than Scrum and Crystal methods.

Scope of use and adoption, in XP the team size to be limited between three and a maximum of twenty project member. Communication and coordination between the project members should be enable in all of the time. The XP should be adoption gradually.

Scrum is a methods for small team. Scrum can be adopted to manage whatever practices are used in the organization. Two type situations in which scrum can be adopted: an existing project and an new project. The crystal methods does not cover life critical project and have limitations of concerning the individual methodologies used in crystal family. There are at least one experience report adopting the crystal family methodology.

5. Conclusion

Agile Methods are a reaction to traditional ways of developing software. The agile methods offer a light and fast software process development.

Each methods of agile software development have their unique characteristic and different usage, depending on the characteristics of each organization. In this article there only three of them are explored. All of them are suitable depends on the characteristic of the project itself.

XP has more phase in their life cycle than Scrum and Crystal. Scrum emphasis on the
management site and has less documentation. Crystal methods based on face-to-face communication, process remains important but secondary.

Crystal methods have no limitation on their team size, more larger the team size more harder the methods.

REFERENCES