

# Analysis of Requirement Engineering Techniques in Agile Development Method

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**Abstract**— Complex enterprise procedures influx is rising in a very competitive ambiance of software program region, that is a very intricate condition for IT industry to curb the timelines deliverance, and penetrating for the approaches to become receptive of their strategies and necessities. This research paper gives a finer indulgent of the utilization of requirement engineering innovation techniques in the progress of agile software. Agile requirements engineering stages are shown and suggests technique that can be employ to accomplish these steps. These methods focus on a reliable connection to the customer to address the specifications progress after some time, arrange them, and provide significant features as soon as possible. This paper studies resemblances and variations of these methods to determine from these methods which one is superlative appropriate for different procedures of development of agile software.

**Keywords**— Requirement Engineering, Agile development Method, Extreme Programming

## I. INTRODUCTION

Every system is depended on requirements it is their main part. The success of any project is depended on obvious and effective requirements in the same way unexplained requirements create a venture failing [19]. Particularly, for commercial software projects the requirements infidelity is a significant challenge [20].

### A. Requirement Engineering

The customer's need is his requirement it informs what to do but not how to do. Requirement Engineering is the process by which requirements are collected, in this system all the requirements are gathered to make the SRS document. [1][2]. Requirements change in an Agile atmosphere and these

alterations are acknowledged during any development cycle stage [2].

### B. Agile Development technique

The procedure of agile development is motivated by client explanations; the clients will tell the Specifications and determine what is necessary. Specifications collected by group conferences in which the connoisseurs of special skills work cooperatively to accomplish a frequent objective. The concentration is on code instead of documentation. The agile technique can adjust the alteration/change in the procedure compared with other traditional models. Most important of agile procedure is to convince the client through fast and ongoing deliverance of useful software [7]. In Agile model, number of agile development techniques include such as Feature Driven Development (FDD), Excessive Programming and Scrum. Extreme Programming is the amount of Clients participation throughout the entire growth procedure is elevated. New client's necessities can be customized along the way. It improves the efficiency by regular "releases" in diminutive growth periods [4]. Scrum is the frequently approved agile technique. It divides the job into amount of little deliverables, priorities and divides the duties into diminutive durations called strolling generally of 2 or 3 weeks. Client collaboration is encouraged in the project [4]. It emphasizes on features defined by the customer and then deliverance is within two or three weeks' time period [4]. It put focus on characteristics which functions are defined by the customer and then providing it in 2 or 3 weeks [4].

Crystal technique is one of the least heavy considered strategies of Agile. It emphasizes more on one on one interaction [6] [22].

## II. PROBLEM DOMAIN

In Agile development following are the issues experienced by Companies for the period of Requirements Engineering procedure.

TABLE I  
PROS & CONS OF SOME AGILE METHOD

Agile Method	Strengths	Weaknesses
Scrum	Optimize the system Endorse Team work	Base of scope slither
XP	quick elevated communication Embrace amendments	Indistinct requirements Lack of documentation
FDD	Proper credentials Full control over the procedure	Elevated level skill development Time consuming
Crystal	Timely deliverance of tasks to user Proficient	Hard to use for tasks with big team

### A. Requirement Engineering Issues in Agile Environment

#### 1) Lack of Requirement's communication are

- Technological improvement
- Client requirements
- Constriction

Requirements collections in one go cannot be appropriate and sufficient, as client can amend his thinking with the passage of time or with modifying atmosphere of business. At the initial stage of agile development no one can proclaim for containing the inclusive information of client's specifications. Amendment in a custom-made need in a procedure of software development is very costly. This means modifying one need can impact the other specifications. If client do not have complete knowledge of requirements then it results in insufficient people interface amongst the specifications and they can impacts the whole procedure of the development of software [2].

#### 2) Non-Functional Requirements

Every iteration in the development of a project the Agile Technique do not provide any appropriate process to handle Non-Functional requirements [9]. Developers can modify regarding non-functional requirements if a customer discover any developers can modify it the next version but if customer understand it as a bit of no significance it can become a risk or a big issue in the products last version [2].

To eradicate this issue agile strategy requires presenting a strategy that could be designate all the requirements which are non-functional of the venture in its initial phase. The agile software development diverse requirements engineering innovations are analysed in this research paper.

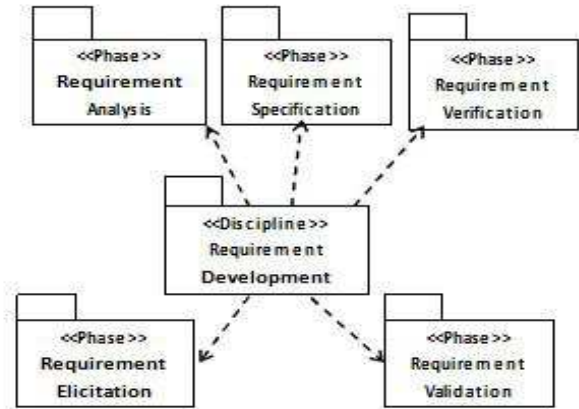


Fig. 1.1 Phases of Requirement Elicitation

### B. An Insight into Requirement Engineering Techniques

The process included in requirement engineering differs from technique to technique. Four stages [10] of requirement collecting stage are revealed in figure 2. In Requirement elicitation stages requirement engineer determine the restrictions (information, time and resources to be categorized) that impact the procedure of crystal-clear requirement procedure

### C. Traditional Techniques

Following are the Requirement engineering techniques

- Modern and team elicitation technique
- Relative technique
- Traditional/customary techniques

#### 1) Interviews

It is the strategy where requirement engineers mend with the stakeholders for specifications and to achieve the target. During the discussions, the organized and unexpected both questions were inquired from customers. So that at the end the useful information can be obtained.

#### 2) Surveys

This strategy includes a large Regional area, contacting larger inhabitants at different places. This method is very Cost-effective, productive and fast.

### 3) Questioner

Its foundation is on set of queries inside the company. This technique is very straightforward need less time, affordable, goal focused. Customers' Requirements can be obtained by making brief and clear questioner. In the form of surveys Functional requirements are predicted.

### D. Model Based Technique

Circumstances explain the communications between customer and the system and approval of specifications in scenario [12, 13]

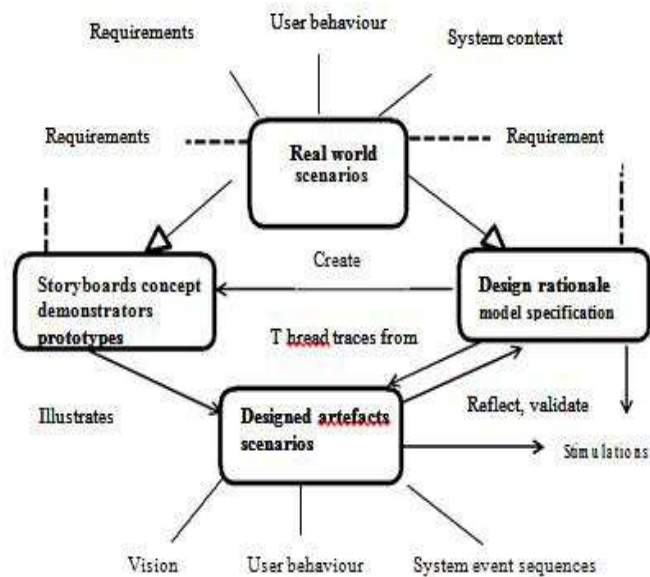


Fig. 2.1 Technique used for Scenario elicitation

### E. Cognitive techniques

Psychological research technique is used to analyses the tasks performed by stakeholders are noticed and on the basis of these activities their behaviours are evaluated. So we can get a closer and better indulgent of project.

Card Sorting is to collect information relevant to current problem card sorting methodologies are beneficial. It comprises of number of customers. Cards are then categorized by the customers and then described the requirements they use for organizing, and the titles they allocate to teams [18,].this strategy needs complete knowledge of that particular field. It is beneficial in showing priority for significant requirements.

Laddering technique is similar to conventional interview strategy in which client needs are extracted through conventional set of questions [3], [7].It is a repetitive strategy

In Repertory Grids, invisible client specifications are discovered. Users are given set of relics that are designed according to their specifications. User deselects the odd ones and chooses those designs close to his requirements. In the form of matrix Requirements are saved. The “constructs” are represents in the form of rows and “Tasks” are represented by in column”

### F. Contextual Techniques

Ethnography is a mixture of different techniques. In need technological innovation perspective, ethnography is connected to human requirements for the verdict of good software in the context of requirement engineering. It includes all of the non-functional specifications such as functionality, efficiency as well as performance [10].

### G. Group Elicitation /Modern Techniques.

The narrative process of need elicitation is brainstorming. In this strategy the focus is less on conversations amongst different stakeholder's categories. Ideas are gathered from members and these concepts are based on their experience and research. It is beneficial in construction of an absolute system image. This method is appropriate for impressive tasks. This period is consists of a team of 4- 10 people. It requires two stages Creation (producing ideas) and Merging (systematizing and providing ideas).

Joint Application Development (JAD) is an organized strategy, in which positions and obligations are described for each participant. It is an Open Conversation system for stakeholders so that they can accomplish the tasks quickly and endow with enhanced implications for the problem. UML diagrams are used to perform the research on these concepts. JAD is open Conversation system for the stakeholders.

The joint application development technique and the User Centred Design are similar the only difference is that the client becomes the part of the development team in user cantered design. The levels are performed in a repetitive fashion, with the pattern being recurring until Goals have been accomplished.

### H. Critical Analyses

The concept of this scrutiny is to inform which elicitation method can be used for a particular strategy of agile development. Numerous techniques and numerous elicitation methods are present; main purpose is to decide the strongly suggested methods for particular strategy during a specific time period [16]. Instead of technical issues the JAD period concentrates on client and system requirements.

### III. THE PROPOSED METHODOLOGY

We have suggested a well-organized and effectual approach for choosing suitable RE strategy for definite technique of agile. Mathematical function is taken as feedback factors and agile technique is taken as RE methods. On the basis of Set concept we have categorized these methods each strategy is a product that is active agent for distinct agile technique. By the help of mathematical set Theory the whole suggested viewpoint can be better described by using labeling. Requirement engineering methods used in analysis are defined by  $r$ , Rmeth is short for methods based on models, Ro is used for subset old methods, Rctx is short for methods based on contextual context, Rcgt is short for methods based on cognition, Rtrd is used for tradition methods and Rcur is short for current methods.

#### A. Mathematical representation

Let the universal set is  $R$  which is holding every requirement method.

$R = \text{RE methods set}$   $R_t = \{ \text{Questionaries, Interviews, Surveys} \}$

$R_{cur} = \{ \text{JAD,UCD} \}$

$R_{cgt} = \{ \text{Protocol analysis} \}$

$R_{meth} = \{ \text{Scenarios} \}$

$R_{ctx} = \{ \text{Ethnography} \}$

Here,  $R_{trd} = R_{meth} \parallel R_{ctx} \parallel R_o \parallel R_{cgt}$

$R = R_{trd} \parallel R_{cur}$

$\parallel$  stands for union of requirements

Every member of requirement set  $r$  will be considered as input 'a'.

Respective output will be represented as  $f(a)$  it is processing result of agile method

We can represent model as

Here assume  $a = R_o \{2\} = \{ \text{Brainstorming} \}$  and different functionalities are  $a_1, a_2, a_3 \dots a_n$

In generalized form  $n$  functionalities will be represented as  $a \}$

$\text{Lim} [a * t]$  represent time limitation, by applying this limitation output  $Y$  will be more mature agile methodology on basis of traditional approach

Generalized mathematical representation of model is

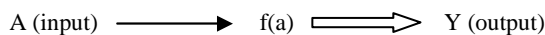


Fig. 3.0 Mathematical representation of generalized model

Architectural representation of agile techniques can be represented as

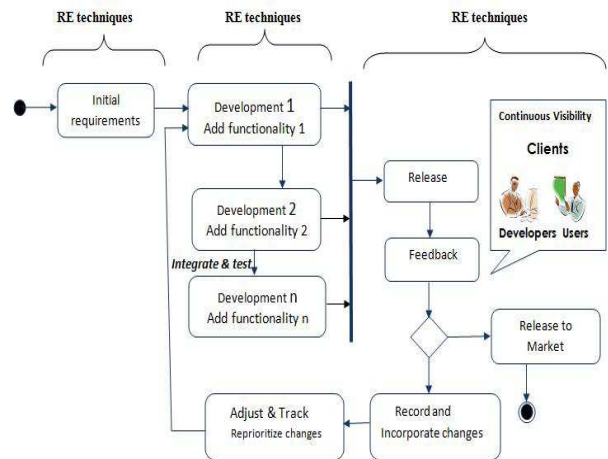


Fig 3.1 Agile techniques Architectural representation

The structure is intended to match all the mentioned strategies of agile. At every stage Specifications elicitation is demeanor and depended on the customers stipulate and appropriate scheme is selected depended on the used agile strategy. Customers are completely implicated and generate their effective participation timely in the whole agile cycle.

#### B. Formal Methods in context of Agile Methods

To check and confirm the growth of scrupulous program formal strategies can be used [18]. Formal procedures can be outstanding sources of creating competent and effective agile cantered program. To model agile development strategy the model based technique is used in this paper. For the creation of the improved agile function ( $f(a)$ ), as mentioned previously, the formal strategy ought to accomplish precise exact development of a system, for a system it is effectual to be produced and endow with a realistic way of managing a process and modelling.

The characteristics are congregated in an efficient component called X-machine. Fienberg [19] presented this X-machine formal strategy. Agile methodologies are used together with X-machines (FDD, Scrum, Extreme Programming (XP) etc.) to acquire customer specifications as information. Customer specifications are well planned due to distinct RE strategy. The X-machine together with storage place or memory works on non-trivial data. Modifications are made to agile development strategy after handling specifications, and noteworthy values are held in storage. 8 row  $Z = (r, O, S, \text{Mem}, \text{¥}, G)$  will store all elements of X machine.

Here

$r =$  input elements of requirement engineering techniques

$O =$  Production

$G =$  proceeding state

$\text{Mem} =$  storage

$S = \{x_1, x_2, x_3, x_4\}$

$\forall =$  processor

Feed to storage  $\forall$ : Mem\*r=O

G:  $S \times \forall \rightarrow S$

For achieving the versatility by means of owing modifications and better growth and the development of software for versions, the full structure is decaying into segments, every component is based on X-machine design. The output of all components is incorporated at the end. During the growth procedure X-machine controls requirements. And X machine was standing in cautious production procedure. Memory of the device is used for keeping variable requirements.

#### C. Related Work

To use X-machine design we have developed a way with a set variety of development strategies of agile that are enclosed in this article result of the device will analyse the most appropriate RE strategy for a scrupulous Agile process.

#### D. Extreme Programming

Excessive programming agile process depends on customer experiences which are considered as information components by X-machine. Xfun influences customer experiences, arrays and arrays within arrays are controlled by X-machine at the same time. This model is used for the development of XP and it is known as XXM (extreme X-machine).

#### E. Scrum

Sprints in Scrum are the requirements in scrum base scaffold and the X-machine accumulates buyer requirements. In the Development stage an accumulation the list of record is managed in a storage space of X-machine to hold customer data. At the requirement collecting stage; Scrum everyday conferences are organized. These conferences endow with a position upgrade to the members. This permits associates to be acquainted with harmonize initiatives and also the probable intricacies to decipher time intensive or intricate problems. The conferences are held for 5-15 minutes usually. These conferences should be short and precise that's why these conferences are organized status upright. In these conferences Suggestion strategy is used which will help out scrum expert to arrange group and to get helpful specifications. After that in product accumulation these specifications are positioned. In the same way process research method effective for Scrum. In process research Advanced level process are decomposed into supplementary palatable pieces and finally achieved the position where all events and activities are entirely illustrated. This strategy utilizes a top-down technique.

#### F. Feature driven development

There are small teams in FDD which are not more effectual than Scrum and XP. In FDD a functional design is developed in first stage which serves all customer specifications as features. The formal X device features are indicated in customer value stipulations like "validate customer password". Every individual function level an organization keeps the improvement rate. The preceding attributes exists in storage of X device. Result will be customer respected function. At requirement engineering innovation stage of FDD procedure research technique is executed. The development team or the programmer's team defines the features of a project team.

#### G. Crystal

The customer's requirements are gathered according to the size of a group by X-machine in crystal based framework. The procedures have their own situate of notations, procedures and positions. This Crystal technique is widely used and simplest strategies in development of software. It essentially created number of agile techniques which are in fact the associates of crystal family such as crystal yellow crystal clear and crystal diamond etc. In this technique group performance, interaction among associates, regular distribution of products and high participation of company is very much targeted. Crystal techniques are versatile techniques preventing the old common firm techniques. The preceding need exists in memory of X device. Result will be customer respected facet function [25].

### IV. CONCLUSION

From the research above it is figured that in agile development Joint application development and Brainstorming approaches are best for requirement engineering techniques. Brainstorming endorses free thinking and the better perceptive of the problem which may bring better and new discovery. Problems are fixed rapidly and promptly in JAD (joint program development) as all the events are there. As joint database integration is a team based classes such as members from different background scenes having audio understanding of the particular structure endow with the angles for need citation. The concentrate is on the requirements and necessities of Stakeholders instead of technological subject.

## V. FUTURE LINE OF STUDY

Like every technique Agile techniques have their pros and cons which are occasionally might not be well designed for the meticulous category of agile development. In future the work could be done to find the ways for the best agile development and describe the association among different agile strategies.

## VI. REFERENCES

- [1] R. Malhotra and A. Chug, "Comparative analysis of agile methods and iterative enhancement model in assessment of software maintenance," *3rd International Conference on Computing for Sustainable Global Development India*, 2016, pp. 1271-1276.
- [2] M. Kumar, M. Shukla and S. Agarwal, "A Hybrid Approach of Requirement Engineering in Agile Software Development," *Machine Intelligence and Research Advancement, 2013 International Conference on*, Katra, 2013, pp 515-519.
- [3] A. Batool *et al.*, "Comparative study of traditional requirement engineering and agile requirement engineering," *Advanced Communication Technology, 2013 15th International Conference on*, PyeongChang, 2013, pp. 1006-1014.
- [4] V. Marinelli "An Analysis of Current Trends in Requirements Engineering Practice " Master of Software Engineering Professional Paper Penn State University Great Valley School of Graduate Professional Studies Malvern PA 2008.
- [5] A. Sillitti and G. Succi "Requirements Engineering for agile methods", Engineering and Managing Software Requirement Springer Berlin Heidelberg pp. 309-326 2005.
- [6] M. Kassab, "An Empirical Study on the Requirements Engineering Practices for Agile Software Development," *2014 40th EUROMICRO Conference on Software Engineering and Advanced Applications*, Verona, 2014, pp. 254-261.
- [7] R. Steven Wingo, Murat M. Tanik, "Using an Agile Software Development Methodology for a Complex Problem Domain" Proceedings of the IEEE Southeast Con 2015, Fort Lauderdale, Florida April 9-12, 2015.
- [8] P. O. Antonino, T. Keuler, N. Germann and B. Cronauer, "A Non-invasive Approach to Trace Architecture Design, Requirements Specification and Agile Artifacts," *2014 23rd Australian Software Engineering Conference*, Milsons Point, NSW, 2014, pp. 220-229.
- [9] G. Azizyan M. K. Magarian and M. Kajko-Mattsson "Survey of agile tool usage and needs." in AGILE. IEEE Computer Society 2011 pp. 29-38.
- [10] Pandey, D. Suman, U. & Ramani, A.K., 2010. An Effective Requirement Engineering Process Model for Software Development and Requirements Management. 2010 International Conference on Advances in Recent Technologies in Communication and Computing, 0, p.287-291.
- [11] D. Mishra, A. Mishra and A. Yazici, "Successful requirement elicitation by combining requirement engineering techniques," *Applications of Digital Information and Web Technologies, 2008. ICADIWT 2008. First International Conference on the*, Ostrava, 2008, pp. 258-263.
- [12] Zowghi, D. & Coulin, C, Requirements Elicitation: A Survey of Techniques, Approaches, and Tools, Engineering and technology
- [13] L. Upchurch, G. Rugg, and B. Kitchenham, "Using Card Sorts to Elicit Web Page Quality Attributes", in IEEE Software, 2001, pp. 84 – 89.
- [14] Tousif ur Rehman, Muhammad Naeem Ahmed Khan, Naveed Riaz, 2013 Analysis of Requirement Engineering Processes, Tools/Techniques and Methodologies.
- [15] T. Vujicic, S. Scepanovic and J. Jovanovic, "Requirements elicitation in culturally and technologically diverse settings," *2016 5th Mediterranean Conference on Embedded Computing (MECO)*, Bar, 2016, pp. 464-467
- [16] D. Zowghi C. Coulin "Requirements elicitation: A survey of techniques approaches and tools" in Engineering and Managing Software Requirements pp. 19-46 2005 Springer.
- [17] V. Rahimian R. Ramsin "Designing an Agile Methodology for Mobile Software Development: A Hybrid Method Engineering Approach" 2007.
- [18] D. M. Mahmud and N. A. S. Abdullah, "Reviews on agile methods in mobile application development process," *2015 9th Malaysian Software Engineering Conference*, Kuala Lumpur, 2015, pp. 161-165.
- [19] C. C. Silva and A. Goldman, "Agile Methods Adoption on Software Development: A Pilot Review," *Agile Conference, 2014*, Kissimmee, FL, 2014, pp.64-65.
- [20] Hasteer, N, Bansal, A, Murthy,B.K, "Emperical Investigation of Agile Software Development: A Cloud Perspective," ACM SIGSOFT Software Engineering Notes, vol. 39, no.4, ACM New York, NY, USA, 1-6, July 2014.
- [21] A. Bansal, N. Hasteer and N. Nazir, "A survey on agile practices in the Indian IT industry," *2016 6th International Conference Cloud System and Big Data Engineering Confluence*, Noida, 2016, pp. 635-640.
- [22] J. Nyfjord M. Kajko Mattsson Commonalities in Risk Management and Agile Process Models 2007 IEEE Computer Society.
- [23] S. Thomas Agile Risk Management 2008 FT Prentice Hall.
- [24] V. Aaen, "Facilitating Agile Innovation", *Agile Processes in Software Engineering and Extreme Programming*, Lecture Notes in Business Information Processing, pp.1-10, 2008.
- [25] Jianxiong Pang and Lynne Blair "Refinement Feature Driven Development methodology for early aspects", Lancaster University Bailrigg (2004).