

A Hybrid Approach of Requirement Engineering in Agile Software Development

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Abstract: Requirement engineering is the important phase in the software development. Here, we gather all requirements of the software which is proposed for development. An agile methodology produces high quality software and takes less time in comparison to traditional methods. Agile was discovered for managing the development process in the environment where requirement could be changed during development process. Requirement engineering is the important phase in the agile development methodology. In this paper, we are providing a hybrid approach for requirement engineering in the agile with the help of JAD and the prioritization of the requirements in the agile is helped by the viewpoint.

Keywords: Requirement engineering, Agile methodology, JAD, Viewpoint

1. Introduction: Agile software development methods have become more famous [1]. A number of methods have been developed for delivering the software on time and fulfill all the requirements of the customer. All these approaches have some shared philosophy: Improved customer satisfaction, implementing the varying requirements, frequently delivering the working software, and tight association of customer and developers. [2]

On the other hand, Requirements engineering (RE) is a software engineering process aimed to identify the requirements, analyze the requirements, documentation of requirements and validate the requirements for the proposed one[3]. Often, requirements engineering and agile development are not matched easily: RE depends upon the documentation while agile development process have customer and developer collaboration to develop the system. In RE, we have JAD technique for gathering the requirements. In JAD session developer, customer and stakeholders discussed about desired product requirement. This kind of session is very productive in terms of requirement engineering. The aim of this paper is to find out a hybrid approach to serve the purpose of agile

requirements. For prioritization of the gathered requirements for the incremental delivery of the software is done through the viewpoint approach which is also a requirement approach. Viewpoints are used for getting the viewpoint of system in the terms of customer. So it will be helpful to decide which requirements are necessary to focus first. The next section of this paper briefly gives an overview of the related work which has done in the field of agile requirement [4]. In

Section 3 of this paper, we propose a model for RE in agile with help of JAD. In section 4, we examine the result of this approach and discuss the benefits of the model. The last section summarizes the model and result.

2. Related Work:

James E. Tomayko explains that the later stages of software development. An agile method provides a better way to deal with these unstable requirements. He suggested two methods for requirement elicitation, user stories and prototyping. The main difficulty in agile environment is cost estimation. Cost could be estimated for current cycle only while cost involved with unknown requirement is difficult to measure. Agile has its own limitation and dependence on test-first programming. It is a basic principle of the extreme programming. It says that early detection of minor errors and detection of defects at the time of integration.[2] [3]

Frauke Paetsch et al. compare the traditional development technique with agile development technique. They suggested various approaches for requirement elicitation in agile such as customer involvement, joint application development session, prioritization, modeling, interviews, brainstorming. The requirement engineering techniques used in agile is sometimes not clearly defined so the actual implementation is dependent on developer. In agile we need

skilled person as developer. While traditional techniques provide a clear view to the developer. Agile techniques rely on minimum documentation but documentation is very important part in maintenance phase so it is responsibility of development team to ensure proper documentation. [4]

Lan Cao and Balasubramaniam Ramesh collected data from 16 organization to perform a study that how agile methodology differ from traditional methodology. Most of the organization that work on agile methodology reported that the main challenge in agile is to maintain a common consensus between various customer groups. They explore test driven development as least used RE approach between organizations. The study identify the most important requirement engineering practices in agile is thorough communication between developer and customer. Instead of using formal specification procedure like in traditional approach, agile requirement engineering is adaptive and dynamic in nature.[5]

Zornitza Racheva, Maya Daneva has focused a most important mechanism of agile that is known as Re- prioritization which helps to accommodate unstable requirements. They derive a conceptual model on the basis of multiple case studies. This model helps for understanding the iteration prioritization process. This model gives answer to the question that, what are the main concepts when consider requirement prioritization process. [6]

Elizabeth Bjarnason takes cases study for a very large organization investigating that how agile methodology overcome the shortcoming of traditional method and what are the new issues in agile. Study shows that issues related to traditional is solved in agile by improving the communication between customer and developer with the help of cross-functional teams, user stories, iterative measure of requirement. Transformation of organization towards agile approach is also a challenging task because of major mindset change and continuous involvement of business units throughout the software development cycle. Another challenge in agile is to maintain balance between agility and stability within development team and customer as well as at project level. [7]

3. Proposed Model: An agile methodology produces high quality software and takes less time in comparison to traditional methods. It was discovered for managing the development process in the environment where requirement could be changed during development process. In traditional methods it is compulsory to fix

all requirements before starting development phase while agile removes these barriers. It is not compulsory to lock all the requirement and design before going to development phase.

The agile methodologies follow the following methods:

Table 1: methods and there description

Methods	Description
<i>Iterative Development</i>	Agile method is lightweight process and it relies on iterative cycles that are short in nature.
<i>Increments of work</i>	Incremental approach provides a way for getting feedback from stakeholder about the actual requirement product.
<i>Collaboration</i>	It believes in assemble customer and development team at one platform. So that they work together
<i>Adaptation</i>	The customer and development team review the requirement elicited and trace the progress of requirement and find the ambiguous requirement to fix it.
<i>Emergence</i>	The team structure and requirement are not fixed at the early phase. It emerges with the progress of the development. Team starts his work with preliminary requirements.

We are here giving the idea for a variant of agile which is SCRUM.

The Scrum methodology is a part of agile methodology [8] . It is designed to handle with environment where requirement could change with time. Scrum methodology project progress forward on the basis of interaction among team members and further divide work in to small modules that is known as “sprints”, with each sprints has limitation of 2 to 4 weeks. Scrum methodology mainly concentrates on management of progress of projects in comparison to how to improve coding techniques. This methodology mainly applied on small projects. Small project can be handled by individual teams while large projects could be divided into subproject and each subproject handled by a scrum team. Communication and priorities between subproject team are managed with the help of scrum technique.

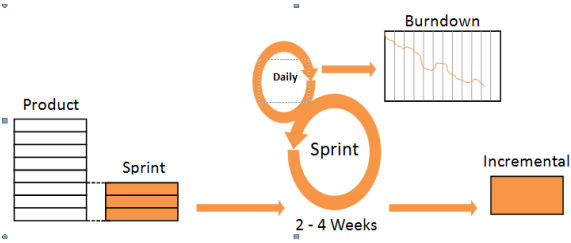


Figure 1: Scrum model

Now, we look how JAD and viewpoint may be implemented in agile software development.

Joint Application Development for requirement engineering: The JAD facilitator and project manager conduct a workshop for all executive sponsor and other stakeholders where they will their own expectations about the system.

Gathering Requirements through sessions:

Extraction of requirement from customers is an iterative process. The fundamental idea behind JAD session is to produce detailed requirements on which JAD group members agree completely. As a result of JAD session, all documented requirements are describing the requirement thoroughly.

This document contains use cases as well as business models which describe how the customer could interact with the system.

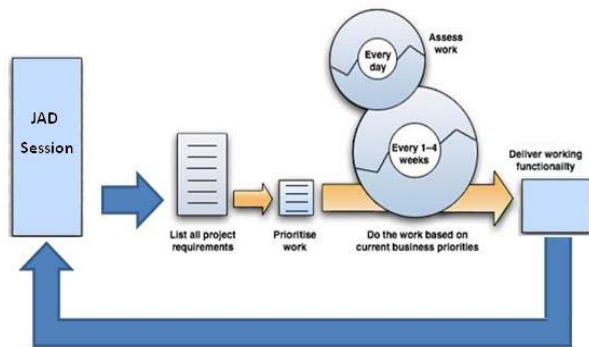


Figure 2: Scrum with JAD

Session for Requirements Analysis:

The gathering process assembles the requirements from various sources while requirement analysis process examines the requirements whether they are complete or not.

JAD requirement analysis performs by various steps:

1. Design a Higher order Activity plan
2. Modeling of requirement on basis of use cases by recognizing the following phases:

- a. Construct documentation for the software requirements by identifying the main flows, business rules, exception flows, alternate flows as well as all other design constraints.
- b. Set priority sequencing for the use cases and requirement lists. These items will be used in iterative release plan later.
3. Generate the State Diagrams and requirements Storyboard for Graphical User Interface design.
4. Establish the business objects and discover their relationships among the use cases. The process of building the Domain Object Model is described below:
 - a. Recognize the “real world” objects first.
 - b. Identify the associations of those objects from other objects
 - c. Identify the multiplicity factor between them.
 - d. Finally publish the List of attributes and couple the operation with each object.
5. Develop a dictionary of all definitions like use cases, actors and business objects etc.

JAD group performs the requirement analysis step based on collected requirement from user interaction. These groups transform the requirements into high level solution which will assist in development phase. Groups include the business subject, matter expertise as well as a complete technical team [9].

The levels of work taken under Focus Group Analysis Session is described as follows:

1. Each use cases with detailed information generated in the requirement phase will be provided. Every use cases must describe the interaction process between user and system. These use cases should contain proper paper prototypes and associated screenshot.
2. All objects, used in the use cases, must be represented with use case scenario.
3. All workflows must be shown by the sequence diagram.

These types of focus groups allow shared requirements. Output of these sessions produces highly refined requirements for development process in a short and certain span of time.

All requirements would be documented for every aspect including management perspective and also tried to discover the uncovered requirements by changing the participant in the JAD sessions. Customer will be directly involved in the requirements gathering process since it is also calculated with the team score.

2. **Product backlog by JAD:** Product backlog is created by gather all requirements using JAD output. So all known requirement is now collected in product backlog [10].

3. Prioritization of requirement: Now all requirements are priorities using VIEWPOINTS with the concern of stakeholder's representative who is associated with development process in scrum. [11] [12]. Viewpoint Requirement engineering is a process where we elicit, model and validate requirement [13]. In this process we consider different viewpoint, which helps us to identify requirements from various perspective. A view point approach is based on the assumption that the entire system requirement cannot be covered by taking single perspective of the system.

A viewpoint extracts information from stakeholder which is to the interest of stakeholder. Many view point-oriented approaches predefine the configuration of viewpoint before their process. [14] On the basis of viewpoint based methods that have been developed, there are two main types of viewpoints:

Viewpoints related to system stakeholders. A stakeholder could be anyone who is affected directly or indirectly by the presence of system. System stakeholder can include end users, manager of organization, all other external entities that are somehow affected by system and the other entire technical person who are responsible for development and maintenance of the system.

Viewpoints related to organizational and domain knowledge. It is the knowledge about constraints associated with the system. The constraints may be organizational, physical, human related. Legal constraints, regulation and standard related constraints are also associated with system.

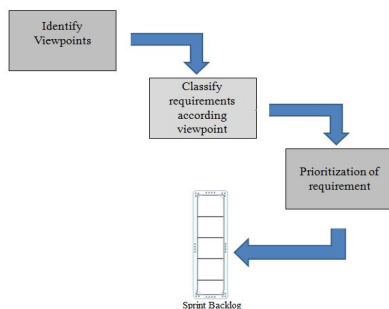


Figure 3: Steps to making print Backlog

Viewpoint gives the ideas that which requirements from product backlog are of higher priority and required to deliver with the current increment. [15] The steps which are associated with the prioritization of product backlog for creating the sprint backlog [16][17]. These steps are shown in fig: 4

a. Identify the possible viewpoints for the system. There could be stakeholder's viewpoint, manager's

viewpoint and all other possible view point of that system.

b. Next step is to classify among the all requirements specified by JAD. Categorize the requirement according to various viewpoint identified in first step and put it in the category where it is most important.

c. Now identify that which viewpoint is most important and prioritize viewpoint. And next is to prioritize the requirement in every viewpoint.

d. In sprint backlog we will take requirements from the viewpoint which is of higher importance in system. We will work on the requirements that belong to most critical viewpoint.

So the decision of increment is associated with viewpoint. Now, we get the sprint backlog which serves the back for incremental approach of the further development.

4. Delivery in increments: increments are verified using viewpoint which was selected by the SCRUM manager. These delivered increments are verified by viewpoint after the release with the help of stakeholder's representative.

5. Repetition for further increments: Step 1 to steps 4 are repeated up to full software development is not done. Next increment is targeted through the rest unfulfilled requirements available in the product back log .Here, if all the requirements are not fulfilled then again arrange a JAD session. These requirements are priorities through the viewpoints, means we will find out the next important aspect of the system

4. Result and Discursion: Requirements are most sensitive phase in agile development process. All requirements are gathered through arranging the JAD session. Joint Application Development (JAD) focuses on group session (or workshop) that follows structured analysis approach. So after this, we get all the requirements of the software .so this provide a systematic way to get all the requirements using interaction with the stakeholders. This is suitable model to use the requirement gathering approach in the agile development. Now the another main task is develop the prioritized sprint backlog which is handled through the viewpoint .Viewpoint gives the idea to focus on the requirements which are important for the increments .Therefore, this hybrid approach gives an effective way to handle the issues of the agile development 's requirements gathering.

5. Conclusion: JAD and view point serve as the key tool for agile software requirement gathering. JAD gives the total customer satisfied requirements which are decided in the JAD session. So it supports the feature of agile. Customer is also in the requirement elicitation process. Increments selection is very much tedious job which is very easily done by using VIEWPOINT. So this hybrid approach reduces the overhead of the scrum manager as well as we can

strongly focus on the perfect incremental delivery as well as good quality software.

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