Different Requirements Gathering Techniques and Issues

Javaria Mushtaq

Abstract- Project management is now becoming a very important part of our software industries. To handle projects with success is very big deal. In software project management process there are some phases, first phase is requirement gathering. To get correct requirement and to handle it, is most important for complete project successfully. Requirement management used to ensure that product or software meets user's need or expectations. Requirements are defined during planning phase and then these requirements are used throughout the project. There are some techniques for gathering requirements. These techniques are interview, prototyping, use case analysis, JAD (Joint Application Design), brainstorming questionnaires and storyboard. While gathering requirement, we faced many issues that are not capable for successful project. In this paper, there will be discussed these techniques and issues that are faced during requirement gathering and their solution.

Index Terms- Software project management, interview, prototyping, use case analysis, JAD (Joint Application Development), brainstorming, questionnaires, storyboard

———————————— ◆ ————————————

1. INTRODUCTION

Requirements analysis is critical to the achievement of development project. Requirements should be measurable, actionable, and testable and also should be related to the user's expectations. Requirement without any ambiguity fulfill the user's requirement make project successful. While gathering requirements focused on "what" should be required rather than "how" it is required [1].

"Using peer reviews, scenarios, and walkthroughs to validate and verify requirements results in a more accurate, specification and higher customer satisfaction."

It is estimated that 85% defects are find in requirements during software development [2]. There are some techniques that are used to gather requirement. Every technique is not used for every project. In these techniques some are useful and some are not but it depends on the project' description.

Good requirement specifications are listed [3].

- Complete
- Verifiable
- Unambiguous
- Modifiable
- Traceable

- *Javaria Mushtaq is currently pursuing MS in Computer Science from Superior University, Lahore, Pakistan. E-mail: javariamushtaq58@gmail.com*

- Usable during operations and maintenance

These requirements specification produce good project. There are some requirements types. Every project has some kind of requirements like [4]:

- Functional requirements
- Non- Functional requirements
- Domain requirements
- Inverse requirements

During requirements elicitation there may be many issues that have to face. That issue and their solutions will discussed in this paper. Different techniques and which one is best for which type of project will discussed in this paper.

2. TECHNIQUES OF REQUIREMENTS GATHERING

In reality there are hundreds of different techniques for requirement elicitation. In this paper, some commonly used techniques are mentioned. These are [5].

2.1 Interview
2.2 Questionnaires
2.3 Brainstorming
2.4 Storyboard
2.5 Prototyping
2.6 Use cases
2.7 JAD (Joint Application Development)

2.1 Interview

Interview is common technique used for gather data or information. In this technique interviewer conduct a meeting with interviewee. Interviews questions should be

according to the interviewee's level. Gather information according to his/her requirement. Questions should be open ended however; interviewee can provide clear answer of your question.

There are three types of questions. These are structured, unstructured and semi structured. Structured interviews are conducted where domain is specified. In this type specific questions are asked and get to the point answer. In this way, all the questions are covered up in this type. The other is unstructured interview in this type interviewer ask questions and require detail answer of these questions. Interviewer applies only partial control over the way of discussion. In this way some topic may be neglected [6]. Semi structured is combination of both. The semi structured interview, where elementary usual of the question is organized and used.

2.2 Questionnaires

Questionnaire is best technique for gathering information. In this technique questions are listed in paper. Questions are filled by the stakeholders and get the answer of these questions. In this technique stakeholders cannot express their idea. No new dimension can defined. Questionnaire type focused on the limited information eliminated unnecessary information [6].

2.3 Brainstorming

Brainstorming technique is group discussion in which members shares their ideas and find out the solution of specific problem. Brainstorming generates or gathers new ideas rather than its quality. This technique is more popular because of it is a group activity all the members share own idea. It is more productive for the reason that groups. When members generate idea it is more value able as of group product and members enjoy the group activity.

There is method for conducting brainstorming task. These are [7]:

- Subjects and design
- Procedure
- Results
- Discussion

It is not compulsory to manage brainstorming sessions for resolve major issues. The purpose of this technique is introductory mission statement for specific problem. Advantage of this technique is encouraging open-minded and free ideas or innovation on particular predefine problem [6].

2.4 Storyboard

In this technique user, customer and developers draw picture of what they want to develop software. Draw picture of all requirement like tool bar, main window, dialogue boxes etc. After draw full picture of all requirements, all members agreed upon on it. It is just like paper prototyping [1]. Storyboarding is very common technique for designing about which you want to get information for their project. Storyboarding is much realistic for understanding about software's structure for unknown persons who do not know about technical terms.

There are some attribute or elements of storyboarding, which explain basic points for draw storyboarding. These are [8].

- Level of details
- Inclusion of text
- Inclusion of people and emotions
- Number of frames
- Portrayal of time

Explanation is given below.

- **Level of details**

Level of details describes existent of actor and objects. It depends upon the designer how to draw scene or describe only detail of interface.

- **Inclusion of text**

In storyboarding text could be including in design with each section. It may be possible designer will not use text.

- **Inclusion of people and emotions**

During designing end users should be in mind. Design should be according to end user that affects the user or stakeholders.

- **Number of frames**

Number of frames should be in mind mostly 1 to 20 frames are included in each story. Each storyboard contains different number of frames according to its requirement. Several features are containing in storyboards.

- **Portrayal of time**

Time passing is include in storyboarding or used transitions.

Figure 1: screen shots of non-functional interface

This figure is about user's purchasing of different foods. User checks different items then add to chart after some time exclude some items then finally select some items and place order [8].

2.5 Prototyping

Prototyping is more significance technique for gathering requirement. Through prototyping detailed requirements can be gathered if preliminary requirement are already collected [9]. Prototyping is much effective for gathering relevant information from users; users provide relevant information and also provide feedback. This technique is useful when users or stakeholders not aware about technical terms in this way they deliver right information and react on their requirement which is develop by designer or developers. Some times this technique is expensive in tenure of cost and time [6]. Prototype can be flat diagrams. It helps us to prevent from misperception.

2.6 Use cases

Use case analysis is a document that defines relationship between actor and system. Arrangement of actions a user uses a system to complete a procedure. Define how system will behave in particular situation. Use case can be used to represent business functionality [10].

An actor is used as interaction with system how to discuss with system or its environment. Use case will be successful when its goal is satisfy. Use case description also include in use case analysis. Use case steps are written in easy and understandable format of use case diagram. System is preserved such as black box, in which actor presents as whom, what will be interact as system and

purpose or goal for interaction with the system without knowing about internal system. Here is format of use case description [11].

Table 1: Template of Use Case

Use case No.	Goal name in verb phase
Goal	Longer detail of goal statement
Scope and level	What system is going to present, summary
Preconditions	What we expected is before now
Success end condition	Successful completion
Failed end condition	What will objective if goal aborted
Primary, secondary actors	Name of primary and secondary actors and their role
Trigger	Activities upon the system that start use case
Description	Description of all over the use case

In table 1 there is given a template of use case description. Actors who will interact with system, goal of use case description, precondition and if use case will not successful then failure condition all these points are mentioned in use case description.

Diagram of use case can present with an actor, use case and system boundary through which actor interact with use case. Diagram of use case presented as:

Use case

Arrow for relationship between actor and system's use case

System boundary (through which actor will interact with use case)
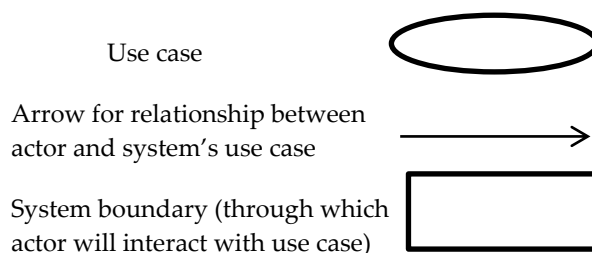
This is a way to present a scenario through diagram. These shapes are used in use case diagram.

2.7 JAD (Joint Application Development)

In this technique all stakeholders are include for solution of problem or gathering information. With all parties decision can be made speedily. Main difference between JAD and brainstorming is that system have previously recognized before stakeholders take part. JAD session is well-maintained with define phases and role of

actors. This type of technique is used for solve business issues rather than technical issues [6].

In JAD session a facilitator include for guideline of system requirement and help out to users for resolve interview, provide information and taking decisions [12]. In early JAD acronym was DESIGN, but now it become joint Application Development. JAD has five stages and their activities; table of five stages is given below [13].

Table 2: Five stages of JAD

JAD Stages	Activities
Project Definition	✓ Define system goal, objective. ✓ Identify JAD team fellows. ✓ Establish project schedule.
Background Research	✓ Gather background knowledge of user requirement. ✓ Known about general issues that will discuss in JAD session.
Pre workshop Preparation	✓ Organize for session. ✓ Prepare all the documents and visual aids. ✓ Train the illuminator.
The Workshop	✓ Conclude solution within three to five day session. ✓ Finalize document meeting decision.
Final Documentation	✓ Prepare Closing document that contain final decision attained at through workshop.

JAD is useful due to some reasons like non contributor are encouraged, dominance is reduced during session, side discussions are include and true conflicts are under consideration in JAD session. Meeting room of JAD is displayed below in figure 2 [4].
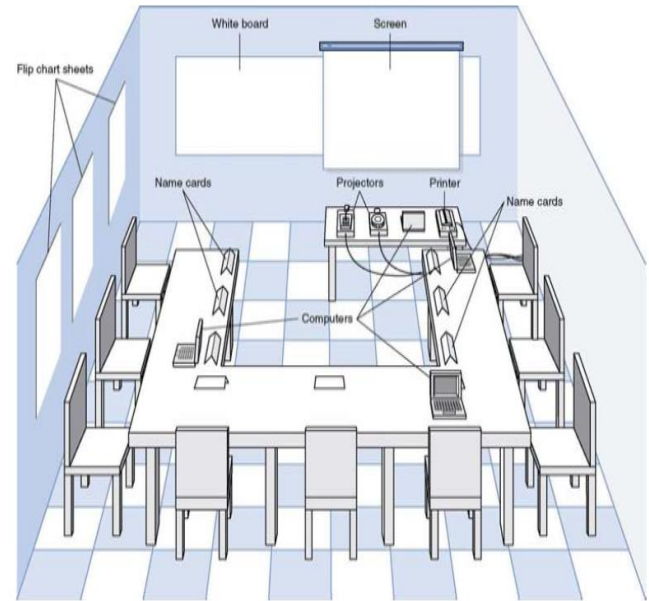

Fig 2: Meeting room of JAD

3 ISSUES IN REQUIREMENTS GATHERING

When talk about the requirement gathering or requirement elicitation then there may be many issues to gather data from users or stakeholders. Here will be describing some issues and solution of these issues [6].

3.1 Scope
3.2 Communication and understanding
3.3 Quality of requirements
3.4 Stakeholders
3.5 Practice

Detail of issues and their solution are specified below.

3.1 Scope

Big issue of requirement elicitation is scope. Sometime user or stakeholders are not familiar or know the scope of project. They can not specify the goal of their project. When scope issue occurs, then it creates issue to gather information from users. Scope should be limited and clearly define. However, requirements can be gather correctly according to user's needs or according to nature of project. Scope is very essential for good software project management. It is seemed that some projects are very worthy but due to limited scope these are not successful.

3.2 Communication and understanding

In communication and understanding issue mostly faced end users. During communication with stakeholders some issue may be language issue. Stakeholders may be possible they do not know the language or it may possible

they are not familiar with your condition and terms. Another issue with communication could be that, however their language is different so their rules may be different. So they are not able to understand your terms and they are not able to specify their own requirement.

Communication issues have four dimensions of the framework. These dimensions show the performance during activity of requirement gathering. These are [14]:

- Stakeholder participant and selection
- Stakeholder interaction
- Communication activities
- Techniques

Explanations of these dimensions are given that can help to solve communication issue.

- **Stakeholder participant and selection**
First select stakeholders for gathering information. Selection should be on right bases and right users. Selection of stakeholders should be on the basis of domain knowledge, about which domain have to gather requirement. Sometime it might be happened to select stakeholders on the basis of their position rather than their knowledge.

- **Stakeholder interaction**
Stakeholder interaction includes get information from them through meeting. In interaction political or culture issue may arise. Different cultures have different language so there should be common language to understand to each other. Meeting schedule should be managed agreeing to both parties.

- **Communication activities**
Communication will possible when both parties cooperate and negotiate. Communication activities categorize into three ways.

One is knowledge acquisition, acquire knowledge. Second is knowledge negotiation, negotiation with other stakeholders for share of knowledge and requirement needs. Third is stakeholder acceptance, these requirements should be accepted by stakeholders.

- **Techniques**
Techniques used for link to developer with customer. To maintain relationship between them two techniques are used, Group and traditional. In group focus, brainstorming and workshops are included. In traditional questionnaire, interview and analysis of existing document are included.

3.3 Quality of requirements
During gather information some users not provide right information they are not serious. Sometime their environment at that time is not according to their needs so they are not able to provide right information. Requirement elicitation is a first phase for initial any project so information should be correct and complete but stakeholders or other users where have to get requirement they do not provide correct and complete information that effects on overall project. At the end project quality not get best due to quality of requirement. Solution is that carefully gets information according to their need and put limited question and get to the point answer in this way quality of requirement can be improve.

3.4 Stakeholders
Stakeholder is one of main issue during requirement gathering. Actually stakeholders do not know what they want and what their need is. They do not satisfy on one point because they really not know about technical terms. They have no idea about software working and system how it works. These are some conflicts that should be removed.

This issue rose due to unawareness of stakeholders. They do no cooperate whole time with project team members. On the other hand, they are not able to finalize the solution of decision of any problem.

3.5 Practice
Generally practice is good factor in requirement elicitation. Sometime not expert analysts are available for requirement gathering or there may be some gap between requirement theory and practice. Sometime analyst repeat mistake again and again. So, hire experience analysts for this purpose.

4 Effectiveness of Requirements Gathering Techniques

There is graph that represent overall effectiveness of different requirement techniques [15].
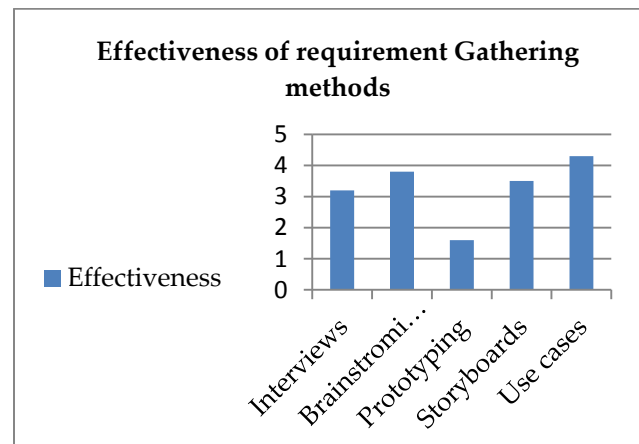
Graph of effectiveness of requirement gathering techniques

This graph shows effectiveness of different techniques that are defined in this paper. Use cases are most effective because every use case present a brief description of what will happen what are causes of that use case precondition, post condition, other actors if are involved in it all these explanation is defined in use case scenario.

5 CONCLUSION

In any project main and first phase is requirement elicitation. Right and correct information from stakeholders are actual significant for successful and without any defect project. So, this paper is about different techniques of requirements elicitation. When talk about techniques then there are some issues. In requirement gathering every technique is not use for every project. Some techniques have some issues that are a cause techniques are used according to project's nature.

Every technique has some benefits and some drawbacks. Before using technique check specifications of these techniques, which one is best or suitable for which type of project? At the end of this paper defined result of techniques of requirement gathering, effectiveness of selected defined techniques.

REFERENCES

[1] Ralph and R.Young "Recommended Requirements Gathering Practices". *Northrop Grumman Information Technology,* pp. 9-12, Apr 2002.

[2] Young and R. Ralph. "Effective Requirements Practices". Boston: Addison-Wesley, 2001.

[3] M. G. Christel and K. C. Kang. "Issues in Requirements elicitation". Carnegie Mellon University: Pittsburgh, Sep 1992.

[4] Y. Tan. IS 460 Notes, lecture 3, Requirements Gathering.

[5] Engineering and Managing Software Requirements. Berlin : Springer Berlin Heidelberg, 2005. Requirements Elicitation: A Survey of Techniques, Approaches, and Tools, s. 19-49. ISBN 978-3-540-28244-0.

[6] D. Zowghi and C. Coulin. "2 Requirements Elicitation: A Survey of Techniques, Approaches, and Tools". pp. 19-46.

[7] P. B. Paulus et al. "Perception of Performance in Group Brainstroming: The Illusion of Group Productivity". *SAGE Social Science Collections,* pp. 78-89, Mar 2015.

[8] K. N. Truong et al. "Storyboarding: An Empirical Determination of Best Practices and Effective Guidelines". *University Park, Pennsylvania, USA,* pp. 12-21, Jun 2006.

[9] R. Silhavy et al. "Requirements Gathering Methods in System Engineering". *Automatic Control,* pp. 106-110.

[10] Requirements Management. *CDC Unified Process Practices Guid,* pp. 1-5, UP version Jun 2007.

[11] A. Bertolino et al. "Use case Description of Requirements for Product Lines". *Nokia Research Center, Software Architecture Group, Finland,* pp. 12-18.

[12] E. W. Duggana and C. S. Thachenkary. "Integrating nominal group technique and joint application development for improved systems requirements determination". *Information and management,* v. 41, pp. 399-411, 2004.

[13] E. W. Duggana and C. S. Thachenkary. "Higher Quality Requirements: Supporting Joint Application Development with the Nominal Group Technique". *Information Technology and Management,* v.4, pp. 391-408, 2003.

[14] J. Coughlan et al. "Communication issues in requirements elicition: a content analysis of stakeholder experiences". *Information and Software Technology,* v. 45, pp. 525-537, 2003.

[15] W. J. Lloyd et al. "Effectiveness of Elicitation Techniques in Distributed Requirements Engineering". *IEEE Computer Society*, Proceedings of the IEEE Joint International Conference on Requirements Engineering (RE'02), 2002.