

Requirement Elicitation Of Large Web Projects

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Abstract: Requirements elicitation is the process of seeking, uncovering, acquiring, and elaborating requirements for computer based systems. It is generally understood that requirements are elicited rather than just captured or collected. This implies there are discovery, emergence, and development elements to the elicitation process. Requirements elicitation is a complex process involving many activities with a variety of available techniques, approaches, and tools for performing them. The relative strengths and weaknesses of these determine when each is appropriate depending on the context and situation. One of the most important aspects of developing a large Web-based project is getting the correct requirements from the client. Time and money can be lost if the requirements are incomplete or inaccurate. Traditional Web design sources tend to gloss over this important activity. Requirement elicitation is a critical activity in the requirement development process and it explores the requirements of stakeholders. The success or failure of this process is based on identifying the relevant stakeholders and discovering their needs as well as the quality of requirements. The quality of the requirements is greatly influenced by methods applied during requirements elicitation process. Only complete and structured requirements make these projects more reliable. The common challenges that analysts face during elicitation process are to ensure effective communication between stakeholders as well as the acquisition of tacit knowledge. Mostly errors in the systems are due to poor communication between user and analyst, and these errors require more resources (time and money) to correct them. The understandability problems during elicitation process of large web projects can lead to requirements ambiguous, inconsistent, incorrect and unusable. Different methods (Conversational, Observational, Analytical and Synthetic) are available to deal with the problems during requirement elicitation process. The challenge for analysts is to select an appropriate method or set of methods and apply them for the clear, consistent and correct requirement gathering. This study based on the results of interviews conducted to the professionals, who have industrial experience in development of web systems. The elicitation problems that are identified in literature and interview along with applicability of elicitation methods for requirement gathering in large web projects development are documented in this report. Software engineering is a mature field that can help in the quest for more complete and accurate requirement gathering. The objectives of this chapter are to present a comprehensive survey of important aspects of the techniques, approaches, and tools for requirements elicitation, and examine the current issues, trends, and challenges faced by researchers and practitioners in this field.

INTRODUCTION

Computer systems have become so important and vital that we cannot imagine our lives without them. Since 1948, when first real computer was invented, the change in our life is called digital revolution. The use of computer applications in everyday life and day to

day business is very much common. Due to development of the commercial of the shelf products, a vast range of fields that use computer and different services are expected by the customers, which make it challenging to develop products which fulfil the customer's expectations and needs [1]. Since 1960, the development of computer system is facing many

problems like not meeting the requirements, or satisfying the intended purpose [2]. This problem resulted in the dissatisfaction of the users. One of main reason stated for this problem is inefficient requirement gathering, as the Requirement Engineering (RE) is the first step in software development life cycle [2].

Requirement is a statement that identifies a capability, characteristic or quality of system in order for it to have value and utility to a customer or user . Requirement is an important factor for the development of any project and it defines what different stakeholders (users, customer, manager and developer) need and how system will fulfil these needs. They are generally expressed in natural language for the reason that everyone can well understand it. Like Software Engineering, Requirement Engineering is also consist of activities which interact with each other to form a whole RE process lifecycle. The RE process contains following set of activities [5]

- Feasibility Study
- Requirement Elicitation
- Requirement Analysis
- Requirement Specification
- Requirement Validation
- Requirement Management

The lifecycle of the RE process is shown in Figure 1.1.

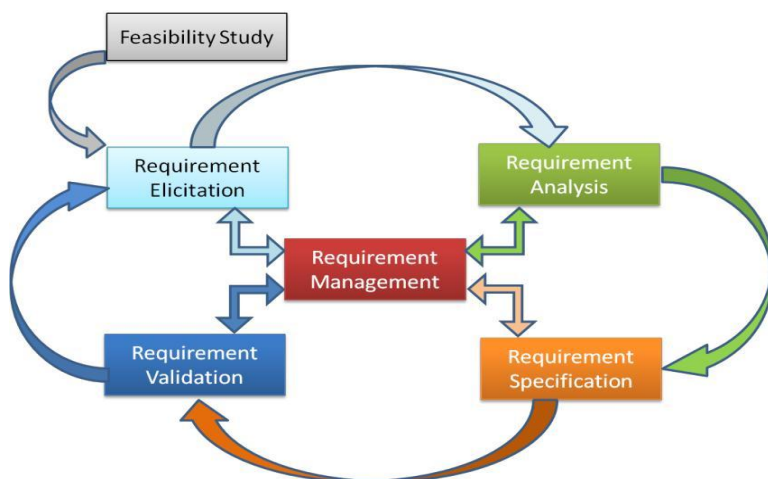


Figure 1.1: Requirement Engineering Process

Requirement elicitation in RE is used to determine the system boundaries and to specify the behaviour of the system. Its success depends on the identification of stakeholders (end users, customers, developers, sponsors) and knowing their requirements. Elicitation is used to address following problems.

- 1) What the proposed system should do?
- 2) What are expected services the system should provide?
- 3) To know the required attributes of the system.
- 4) To know the hardware and software constraints.

Frequent sources for this phase are:

- ✓ End Users/Customers
- ✓ Domain experts
- ✓ Existing system documentation
- ✓ Users of existing system
- ✓ Similar Applications

While requirement elicitation, it is important for analyst to consider all the possible sources in order to better understand the application domain. During elicitation process analyst face number of challenges like

- Lack of domain knowledge
- Communication breach
- Resolving good requirement source
- Political influences
- Budget constraints
- Time constraints

In order to cope with all above challenges, several requirement elicitation techniques have been developed. These techniques vary in term of effectiveness depending on project's nature. While requirement elicitation, proper technique selection

plays crucial role. The importance of technique selection in requirement elicitation process has already been highlighted in literature. Many models for requirement elicitation have been proposed where technique selection got focus. One problem with all presented models in literature is that all have human interventions while technique selection. This human involvement may bias the technique selection decision. This is the main focus of this research work.

II. RELATED WORK

2.1 Requirement Elicitation Technique

A technique is basically a practical method applied to some task and an approach is the systematic arrangements of ideas to deal with some situation [2]. The requirement elicitation techniques are the methods applied by the experts to elicit the requirements of the proposed system. The success of large projects mostly depends on the quality of requirements elicited during requirement elicitation. This quality is normally achieved by appropriate selection of techniques from available ones. A range of elicitation techniques has been proposed in literature like interviews [25], protocol analysis [26], JAD [27], repertory grid [28], workshops [29] etc. As the stakeholders involved in elicitation process belong to a variety of backgrounds having different capabilities and domain knowledge. Therefore in most of the cases a single technique cannot give the best results [30]. Organizational processes, domain type, resources availability and individuals liking are the factors which affect technique competence. Most of the time combinations of techniques are also used to deal with issues that one method cannot address [31]. Several elicitation techniques are available to address different requirement problems and having varying amount of advantages in terms of simplicity, complexity and maturity [32]. These techniques are divided into four categories with respect to mean of communication:

Conversational, Observational, Analytical and Synthetic [30]. No doubt, in literature there are dozens of requirement elicitation techniques but we are interested in techniques which are widely used and representation of range described in literature. We also tried to include at least three techniques from each of above categories. Techniques

S. #	Technique Category	Elicitation Techniques
		Interviews
		Requirement Workshop
1	Conversational	Focus Group
		Brain Storming
		Social Analysis/Observation
2	Observational	Ethnographic study
		Protocol Analysis
		Requirement Reuse
		Documentation Study
3	Analytical	Laddering
		Card sorting
		Repertory Grid
		Scenarios
		Prototyping
4	Synthetic	JAD
		Contextual Inquiry

selected for this study are shown in Table 2.1.

Table 2.1 Requirement elicitation techniques along category.

2.2 Requirement Elicitation Techniques Selection

Models

As we have studied that there are many requirement elicitation techniques with primary aim of assisting analysts to understand the user needs [31]. It is sometimes mistakenly assumed by analysts that one single technique can be sufficient to elicit all type of requirements [32, 33]. Different studies have demonstrated that elicitation techniques are not identical and there exist obvious difference between them [34, 35]. There exist issues like quantity of information and elicitation efficiency that differentiate these techniques [36].

As there is no absolute technique for a particular project, therefore, there is a strong need to select a particular technique from numerous available [41]. Analysts normally select a technique for any of the following four reasons [6]: a) Only technique known by the analyst, b) Analyst's favourite technique, c) the technique is prescribed by the methodology followed by the analyst, d) the analyst select instinctively a suitable technique. Mostly analysts are influenced by first three reasons although the fourth one is most mature [6].

2.3 Elicitation Barriers

In most cases stakeholders cannot explain what they really want? E.g. the stakeholder feels a problem but cannot express and sometimes user does not feel anything but requirement analyst can see several problems. There is also a trend of exaggeration of today's issue and underestimate crucial problems, even if stakeholder sees the problem but cannot express it as a requirement. Another barrier to requirement elicitation is that, sometimes stakeholders have the problem of explaining what task they perform and why they need to perform such tasks. Some users

specify a solution instead of a demand, e.g. a manager might state that "we should have a computer based decision support system". It takes the almost a long time to figure out that the real problem is not to discuss and to decide, but to implement what has been decided. The decision support system would not help with that. The users may find it difficult to think about new work procedure of imagine the consequences of doing a familiar task in a proposed new way. For example, in a multi-national organization, it took a long time to realize that the ever growing problem of the getting through to peoples on the phone could partly be solved with instant messaging/discussion board/forum in a web system. Later, the commencement of these features in web systems change the work pattern in an emerging way. In large projects there are several stakeholders attached to the same project and may be distributed at different locations. Often different stakeholders have confliction in their views.

- Scope Barriers
- Communication Barriers
- Volatility Barriers

III. PROPOSED WORK

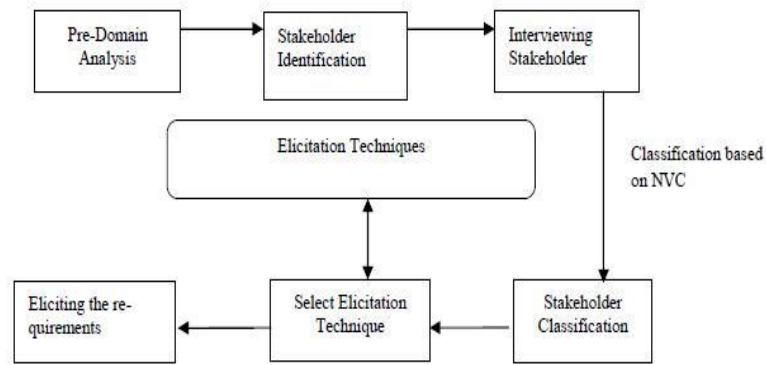
Requirements elicitation is generally performed using an elicitation methodology or a series of techniques. Many such methodologies and techniques exist, all with the common aim to assist elicitor in understanding needs [9]. Although some elicitor think that just one methodology or just one technique is applicable to all situations, one methodology or technique cannot possibly be sufficient for all conditions [10]. Analysts select a particular elicitation technique for any combination of four reasons: (1) It is the only technique that the analyst knows, (2) It is the analyst's favourite technique for all situations, (3) The analyst is following some explicit methodology, and that methodology prescribes a particular technique at

the current time, and (4) The analyst understands intuitively that the technique is effective in the current circumstance [8]. It is well documented from the discussion, the present challenge during requirement elicitation is to select appropriate technique. Interacting Stakeholders during Requirement Elicitation, generally elicitors emphasize on verbal communication. The area of non-verbal communication (NVC) is still un-touched. But when we observed behavioural aspects, cues and signals of Non-Verbal communication like the use of facial expressions, eye contact, gestures, Tone of voice, body posture, orientation, touch, and various cues and signals such as distance, amused, sleepy, pitch, sound, pacing. NVC plays an important role while interviewing and interacting stakeholders during Requirement Elicitation. Non-verbal behaviour of the stakeholder can be analyzed by the elicitor in order to record the requirement. If elicitor has ability to observe and documenting Non-verbal communication during stakeholders interaction effective requirements may be recorded [11]. The major challenge of the elicitor is to record stakeholder's observation, classify the stakeholders accordingly and use this as base for selecting appropriate technique of elicitation so that effective requirements are elicited.

REQUIREMENT ELICITATION TECHNIQUE SELECTION MODEL

- Pre-Domain Analysis
- Stakeholders Identification
- Interviewing Stakeholder
- Classify Stakeholder
- Select Elicitation Technique.
- Eliciting the requirements.

Fig: 3. 1 Stages of Proposed model.



RESULTS

We have conducted personal interviews with five personnel, working in the different development organizations. The purpose of this interview was to identify the possible communication barriers in requirement acquisition process of large web projects. And find out elicitation method(s) for requirement gathering of these projects. In this chapter, we will present the results of our study and try to answer the research questions based on the findings from this study. The data of interview results is presented in the form of figures along with explanations. Over the years a number of important trends and challenges have emerged within the field of requirements elicitation in research and practice although not necessarily the same for both. For that reason we have divided the following section into four areas, namely (1) trends in research, (2) trends in practice, (3) challenges in research, and (4) challenges in practice. These trends and challenges show how the field has progressed and changed, and what still needs to be done to further evolve this process in research and practice. One of the key challenges for researchers remains the development of ways to reduce the infamous gap between research and practice in terms of awareness, acceptance, and adoption. This can only be achieved by establishing the results in practice and making the approaches more attractive, thereby providing the proof and motivation for practitioners to use them. In order to make this happen, re-searchers need to reduce the complexity of approaches, and expertise required to integrate them into practice.

Packaging them into manageable and flexible components with appropriate tool support can facilitate this process. It is important to work towards reducing the gap between experts and novices through practical roadmaps, frameworks, and guidelines that can be easily taught to students and novices. Finding more efficient and effective ways to transfer expert knowledge is certainly part of this effort. Furthermore educators need to adequately address the wide range of skills and expertise required to produce effective requirements engineers, and provide authentic learning environments for gaining realistic experiences. Overall research needs to continue to develop ways of improving the process and quality of requirements elicitation, and quantifying its success. Only through application to practice can the true value of new techniques, approaches, and tools be determined.

V. CONCLUSION AND FUTURE WORK

5.1 Conclusion

The focus of this report was to find out the problems in requirement elicitation process of large web projects. Along with identification of methods that can help the analysts in requirement acquisition and solution to the problems. In the shed light of literature study and interview results, we have identified three categories of problems scope, understandability and volatility that faced by analysts in requirement elicitation process. The communication problems lie under understandability shadow. It is found that lack of understandability is the root cause of all other problems, and poor communication is first step toward project failure. These problems are curial because they related to stakeholders and stakeholders have cognitive limitations while expressing their needs. Communication barriers can be arisen due to problems “within” individual user, “between” two users or “among” group of stakeholders. These problems become more abstruse in large web projects because stakeholders are distributed geographically. It is hard to overcome these shortcomings because lack of direct interaction among stakeholders.

5.2 Future Work

Below we have listed some of the potential requirements elicitation research areas not completely resolved to date that we believe deserve appropriate attention in the coming years:

- Reducing the gap between the theory and practice, and experts and no vices
- Increasing the awareness and education of analysts and stakeholders in industry
- Developing guidelines for technique selection and managing the impact of factors on the process
- Investigating ways of collecting and reusing knowledge about requirements elicitation
- Integration and use of new technologies including web and agent based architectures into the next generation of support tools
- Produce and publish case studies and industrial experience reports on how requirements elicitation contributed to successes and failures of projects
- Exploring how requirements elicitation activities relates to new and developing fields of software engineering such as agent based systems, agile development methodologies, and web systems

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