

## A Review on Effective Requirement Elicitation Techniques

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### ABSTRACT

Requirements elicitation (RE) is the most critical phase in requirement engineering. Most of systems fail just because of wrong elicitation practice. Effective techniques are used to determine creative and innovative requirements to understand client's expectation. In this paper, a systematic review on journal and conference publications those are related to effectiveness, effective techniques, requirements Elicitation and empirical evaluation on effective techniques for requirements Elicitation is performed. In the systematic literature review, IEEE, Springer Link and Science Direct are used as a source. Then, relevant search terms are using to search the journals and conference papers (open access articles or archive articles) since 2014 until 2015. The search result is minimized by combining effective and Requirements Elicitation Techniques and then goes through the title and keywords, abstract and selected articles for review using inclusion and exclusion criteria. From the systematic review, the roles of effectiveness are determined and the impacts of effective techniques in requirements Elicitation area are identified.

**Keywords :** Effectiveness, Requirement Elicitation, Requirement Engineering, Techniques.

### 1. INTRODUCTION

Requirements elicitation is one of the most crucial phases in the software development life cycle as stated in [1] and [2]. Paper [3] stated that using an appropriate method can help in producing a consistent and complete set of requirements with reduced cost and time. Requirement elicitation is a process to identify and analyze the stakeholders or clients' needs, purpose and significance of system development as in [4], [5], [6], [7] and [8]. Requirement Elicitation is one of the important factors in developing any new application. Reference [9] stated that most of systems fail just because of wrong elicitation practice. It is regarded as the first phase of the Requirement Engineering process and normally considered as the process of finding out 'what are the real needs of the customers as well as of the system'. It also includes activities to explore 'how the software can meet the stakeholders' goals' and 'what alternatives might exist' as in [6]. Requirements elicitation is a complex process involving many activities with a variety of available techniques, approaches for performing them. Several researches and

practices within RE have been largely directed towards improving the elicitation process through development of various techniques as in [6]. Papers [3], [5], [6], [10] and [11] stated that there are five Requirement Elicitation Techniques which are Traditional Techniques, Collaborative Techniques, Contextual Techniques, Cognitive Techniques and Innovative Techniques. The selection of techniques to be engaged is dependent on the particular environment of the project and is often a serious aspect in the accomplishment of the elicitation process. The selection of techniques is based on analyst choice or prescribed by a specific methodology as in [5].

Therefore, in this paper, the introduction of Requirements Elicitation and techniques, tools or methods is described in first section. Second section discusses on the review questions and methodology including Data Sources and Search Strategy, Study Selection, Study Quality Assessment, Data Extraction and Data Synthesis Process. The inclusion and exclusion criteria of article selection for literature review are in third section and the fourth section describes the result and findings. Fifth and Sixth section review question analysis and gives the idea of strength and weakness of the study and result and finally is conclusion.

### 2. REVIEW QUESTIONS AND METHODOLOGY

In this section, review questions will be defined and review methods of the systematic review will be discussed [12].

#### 2.1 Review Questions

- a) What are the influential effective techniques for Requirements Elicitation Process?
- b) Why effective techniques are important for Requirements Elicitation Process?

#### 2.2 Review Methods

##### 2.2.1 Search Term Construction Process:

- a) The key search terms are created from the research questions observing the context, result and association.
- b) Generate similar search terms using synonyms of those terms and collect idea from some other papers in the same research area.
- c) Perform Boolean AND operation to link the result of two search terms and to make search more specific.

- d) Perform Boolean OR operation to make wider result among similar search terms.

**2.2.2 Search Terms:**

- a) Effective techniques
- b) Effective tools
- c) Effective methods
- d) Importance
- e) Requirement Elicitation
- f) Requirement Elicitation Process
- g) a OR b OR c OR d
- h) e OR f
- i) {a,b,c,d} AND {e,f}

**2.2.3. Search Engines & Databases:**

- 2. IEEE
- 3. Springer Link
- 4. Science Direct

**3. INCLUDED AND EXCLUDED STUDIES**

**3.3.1 Inclusion Criteria**

- a) The full text of the article available in .pdf file.
- b) The article is published in open access as journals or conference papers between the years of 2014 until 2015.
- c) The article can be case study, empirical study, experimental study, comparative study, literature review and systematic review, survey or action research.
- d) The article will include at least one of the key words or search terms.
- e) The article will discuss an empirical evaluation about effective techniques, tools or methods for Requirements Elicitation.
- f) The article will be chosen if it includes general knowledge about different kinds of effective techniques, tools and methods.

**3.3.2 Exclusion Criteria**

- a) The articles, which don't meet the terms and conditions of inclusion criteria, will be excluded.
- b) The articles, which are only related with the software requirements engineering, will be excluded.
- c) The articles, which are only related with the industrial approaches and effectiveness, will be excluded.
- d) The articles, which are not defined as reliable (such as web pages) will be excluded.

**3.3.3 Quality Criteria**

- a) Suitable and clear abstract and introduction of effective technique is provided.
- b) Background and future work of the study are discussed.
- c) References maintained accurately.
- d) The research methodology and approach defined explicitly and suitable for the problem analysis.
- e) The research questions defined correctly and they are covering the study totally.
- f) Problems of the specific study are explained and the problem domain is composed.
- g) If the study is empirical, negative and positive results and findings about effective techniques are discussed.

**4. RESULTS AND FINDINGS**

During the searching process of related articles, research was based on inclusion and exclusion criteria. For some situations, decision of inclusion and exclusion criteria was checked in several times. By using search terms and search strings, relevant and reliable articles in literature resources like electronic databases are scanned. As the first step of searching articles, databases are scanned according to search terms. After that, search results, which were identified in each database by using each search term, were saved in MS Excel file. At the same time, by using inclusion and exclusion criteria, all the relevant articles were refined.

In this systematic review, related sources in three common electronic databases are searched from 2014 until 2015. A huge number of articles were found for the first time searching on these databases. To cater this problem, the next step is focusing on the titles and keywords to get Second Result and refining abstract to get Selected Result. By refining for these articles, numbers of relevant articles were reduced. Lastly, all the relevant articles again were refined on the basis of inclusion and exclusion criteria and the final search results were formed.

In Figure 1 is the process of Article Review and in the Table 1 is all quantitative results were exposed by each database:

Table 1 : Search Result

Database Name	First Result	Second Result	Selected Result
IEEE	6	2	2
Springer Link	43	1	1
Science Direct	370	12	11
<b>TOTAL</b>	419	15	14

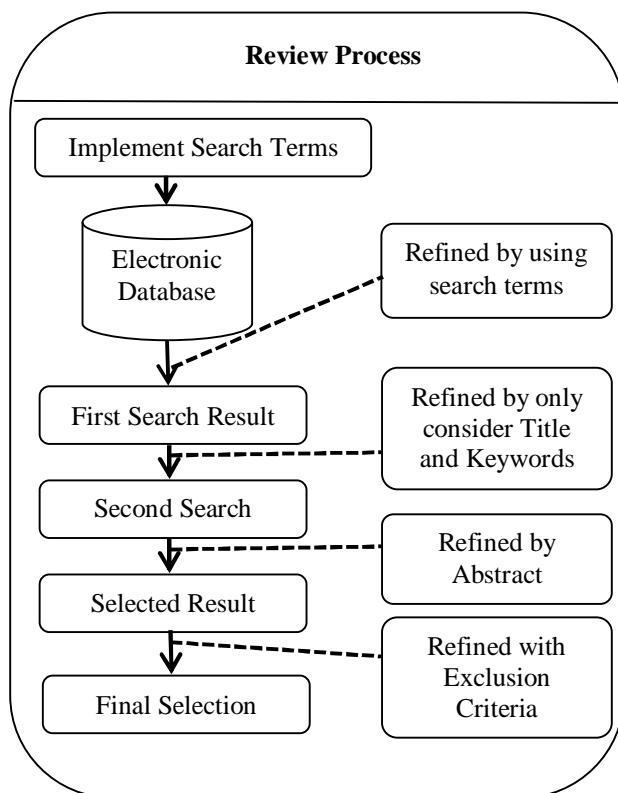


Figure 1: Article Review Process

## 5. REVIEW QUESTION ANALYSIS

### 5.1 Review Question 1

The quality of the requirements is impressively influenced by procedure active during requirements elicitation because elicitation is the process of collecting the needs of users and communicating those needs to system experts as in [5]. Requirements elicitation is a serious phase of the RE process, usually followed by analysis and specification, integration and validation of the requirements. The main purpose of this process is to classify the system limitations and specify the efficient and communicative properties of a system. The success of this process bases on recognizing the appropriate stakeholders from different background and determining their needs. It is very vital to include the all stakeholders in information gathering otherwise certain viewpoints are never exposed.

According to observation and understanding, through the systematic literature review there are several effective techniques for RE, which are used for generating new and quality ideas to improve the understanding of requirements. Those effectiveness' techniques are user story, REST-bench, emotion-led modelling, icon-based modelling; ontology based persona-driven approach, Secure Tropos-SPL, gamification approach and online serious game as in [13], [14], [15], [16], [17], [18] and [19].

Paper [14] stated that REST-bench providing an assessment tool that illustrates the coordination in software development projects and identifies concrete improvement opportunities thus it also recently introduced techniques in RE.

Paper [20] stated that visualize requirements in order to carry out effective requirement elicitation in order to increase user involvement and increase the perception of their relevance in the requirements elicitation activity Emotion-led modelling and icon based modelling is laid under this category. Both modelling is able to give positive basis on which to construct a requirements engineering as in [15] and [16].

Many ontological approaches have been successfully applied in the field of Requirements Engineering [21]. Ontology based persona-driven approach to requirements analysis and modeling that empowers requirements and knowledge engineering with the concept of persona and an ontological knowledge representation of users' characteristics [17]. Therefore this combination is able to emerging in understanding the requirements.

By using gamification concept in RE the participants in the case studies also feel that this approach is useful and motivates them to participate in requirements elicitation [18]. In addition, utilizing online serious games is an effective method for increasing motivation among customers to actively participate and engage in the requirements elicitation process [19]. These recently introduce techniques seem to have a positive feedback from the participant at once able to upgrade the techniques available in understanding requirements in the future.

### 5.2 Review Question 2

In this paper, eleventh (11) papers were found as a result of systematic review as stated in Appendix A. According to these papers, effective techniques are important for Requirements Elicitation Process. Shreta Sharma and S. K. Pandey [6] stated that RE helps organizations to develop quality software systems within time and budget constraints offering true reflection of customer needs.

A prime goal of investment in requirements engineering is to produce a comprehensive, consistent set of system requirements covering various aspects of the system such as operational environment constraints, general functionality requirements and so-called non-functional requirements such as performance and security as stated in [20]. Therefore choosing the effective techniques is important in Requirements Elicitation. As stated in [22], by having effective elicitation techniques benefit the externalization and representation of knowledge, according to the nature and complexity of application of each technique. On the other hand, paper [23] mentions that RE approaches will

allow us to overcome limitations of traditional approach and allow end users to play a more prominent role in RE.

## 6. DISCUSSION OF THE SYSTEMATIC REVIEW: STRENGTHS AND WEAKNESSES

The main strength of this literature review is it covered a large number of articles those are published in different journals and conferences paper since 2014 to 2015 from three common electronic databases. The review is strictly followed the selection criteria for improving the search quality. Besides, almost all the aspects of the review questions were covered through the literature review. However, the weakness of this review is a search term is not as accurate as it could be in view of lack of expertise to make it simple and wise.

## 7. CONCLUSION

Currently, developing software is becoming more complex and it is difficult to handle with this situation only through traditional techniques, ideas or processes. Without effective techniques in Requirement Elicitation, there are difficult to find creative or innovative ideas to solve this problem. By implementing this systematic review, information about effective techniques for Requirement Elicitation and also their relationship and usefulness of creative techniques, methods and approaches in requirements engineering area is defined. From this systematic review, various techniques and appropriate of effective is found in Requirement Elicitation. Anyone can find related paper by this systematic review and can analyze the result for further research on this area.

## APPENDIX

Appendix A is listed an id, reference number and publication year for eleventh (11) chosen papers.

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#### APPENDIX A:

Chosen papers are listed with their id, reference number and publication year.

ID	Ref No.	Year	Title
1	13	2015	A comparative study of software tools for user story management
2	14	2015	Assessing requirements engineering and software test alignment - Five case studies
3	15	2015	Emotion-led modelling for people-oriented requirements engineering: The case study of emergency systems
4	16	2015	Can icons enhance requirements engineering work?
5	17	2014	Towards an Ontology-based Persona-driven Requirements and Knowledge Engineering
6	18	2014	Secure Tropos framework for software product lines requirements engineering
7	19	2014	Gamifying requirement elicitation: Practical implications and outcomes in improving stakeholders collaboration
8	21	2015	Combining ontologies for requirements elicitation
9	20	2015	Synergy between Activity Theory and goal/scenario modeling for requirements elicitation, analysis, and evolution
10	22	2014	Knowledge management acquisition improvement by using software engineering elicitation techniques
11	23	2015	Using popular social network sites to support requirements elicitation, prioritization and negotiation