

Project plan for degree projects
PA2554: Research Methodology in Software

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Thesis	Tentative title	A Systematic Literature Review on Automating Requirement Elicitation.
	Classification	Requirement Elicitation, Automation, Approaches.
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1. INTRODUCTION

In today's world, the software industry is developing rapidly. With the growth of software, there is a possibility of occurrence of both pros and cons. Requirement engineering is a process of elicitation, negotiation, and validation of the requirements. Requirements elicitation, as the first phase involves the activity of collecting information from various stakeholders who are responsible for software development. The requirements elicitation is the most important phase of software development because small error at this stage can result in absurd software designs and implementations [8]. Its importance is becoming more and more prominent because acquiring requirements effectively will ultimately improve quality of the software [3].

Elicitation process is known to be time-consuming and error-prone when performed manually by a requirement engineer [1][5]. Acquiring fast and accurate user requirements from customers is a problem that people want to solve for a long time [3]. Software organizations across the world practice continuous delivery, which is an automated implementation of develop, integrate, deploy, test and release processes. The automation of requirement elicitation process will also reduce the effort for the practitioner by minimizing time spent on requirements gathering and focus on further phases of development. It saves time for all the stakeholders when automated as there will be no need for frequent meetings. The automation of the initial phase that is requirement elicitation can also contribute to a long-standing challenge of automated software development [8].

2. RELATED WORK

2.1 Motivation

The main purpose of this research is to explore 'when to automate' requirement elicitation process and explore approaches for automation in requirements elicitation and deduce the challenges for a successful software development of an organization/institute.

The following objectives were kept in mind while performing the research:

- To identify the research gap in this area of research.
- To examine the approaches for automation of requirement elicitation process and find challenges faced by requirement engineer.
- In addition to those, identify when automation should be done and in which area of industry can it be done.

2.2 Literature review:

A literature review is conducted, apposite literature is selected by identifying appropriate keywords, forming search strings and searching in databases like Scopus and Google Scholar. Snowballing method [11] is used to find related sources from the list of articles.

The study done on those papers selected by the above criteria are summarized in the following section.

2.2.1 Reviews

Automation is playing a vital role in requirement elicitation for the past 30 years. The automation process can be carried out using different approaches. Which approach to choose is based on different factors like individual preferences, available resources, application type, etc. [9]. Moreover, the approaches taken by the engineers, do not limit to one technique [9]. Each approach provides an ideology of how to automate requirements.

The requirements specified in English can be ambiguous and inconsistent due to inherent syntactic ambiguities and semantic inconsistencies [8]. English in the SRS is translated to SBVR (Semantic Business Vocabulary and Rules). SBVR representation not only generates accurate and consistent software models but also machine processable as SBVR has a pure mathematical foundation [8].

The transfer of knowledge from unstructured **natural language** to natural language helps in communicating with wide range of stakeholders [1]. According to Mich, natural language has great role in the requirement elicitation as it acts as a bridge between the stakeholders and the customers [3] Furthermore, in the domain experts-based approach [9] the stakeholders can directly interact with the system. Requirement engineers use the inputs from users and customers responses (their responses are based on the domain information provided in the database) to automatically create drafts, which will be used in the interviews with the stakeholders. Ever the Decision-making based approach believes that complete knowledge of the domain is available at its aid, using which continuous interaction is carried out with the user [3].

The research is done using the **machine learning** system with **automation** on requirement phase which deals with knowledge acquisition and belief revision in the knowledge-base [4]. By collecting information from stakeholders using different algorithms and integrating them together with different learning methods and acceptable reasoning.

The analysis **models** are build and transferred as model transformations to create a working code [1]. Requirement models which fit the user's purpose are identified [3]. A decision process is proposed which helps in determining an optimal model with least user interactions. Another approach proposed is the Unified Business Process Modeling method (UPROM), which analyses and develops models for a business process which provides rules and guidelines to conduct the better analysis. Using the UPROM application the project model is formed. These models are used to generate user requirements automatically in the textual format [10].

In the process of automating, some common challenges that were encountered are: -

1. Familiarity of the software engineer with the application domain.
2. Motivate customers to elicit proper requirements.

3. RESEARCH QUESTIONS

The research questions that are formulated based on the identified research gap are

RQ1) What are the challenges faced by the requirement engineering team while performing approaches to automate requirement elicitation?

Description: Knowing the challenges faced by the practitioners helps to mitigate the problems and ensure automation effectively and efficiently.

RQ2) When to perform automation of requirement elicitation in software development?

Description: By obtaining the answer for “When” to automate, we can implement automation in elicitation process.

4. RESEARCH METHODOLOGY

4.1 Data Collection Method

There are different empirical research methods used in software engineering such as experiments, case studies, surveys, action research, and simulations.

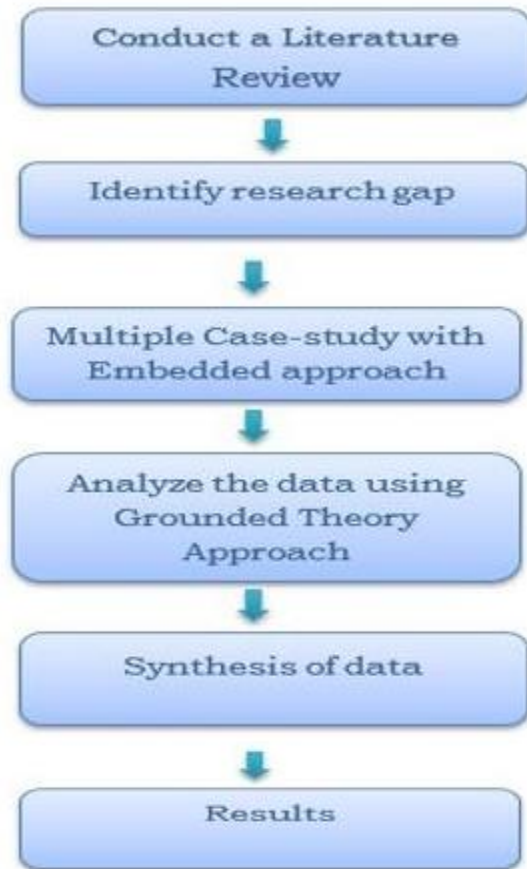
- *Experiments* [13] require complete knowledge of all data at the initial stages of the study, Whereas in our research we can identify data only after exploration.so we eliminate Experiments.
- *Action Research* [12] focus is on spotting the real world and attempts to improve the situation. Since in the study, it is not possible to take part in the real-world situation and observe its effects take an action, Action Research is ruled out.
- *Survey* [12] is referred as research in breadth as it collects an overview of phenomena with respect to a population. Our research is to be conducted with the requirement engineers of the company to obtain their opinions and experiences. Hence survey has been eliminated.
- A case study is an approach to research that facilitates exploration of a phenomenon within its context using a variety of data sources [14].

After relating various research methods available for software engineering, we have selected case study as an appropriate empirical research method to carry out this research and to answer the research question.

According to Yin (2003) a case study design should be considered when: (a) the focus of the study is to answer “how” and “why” questions; (b) you cannot manipulate the behavior of those involved in the study; (c) you want to cover contextual conditions because you believe they are relevant to the phenomenon under study; or (d) the boundaries are not clear between the phenomenon and context [14].

As the research objective is, looking at a problem which is a need to the industry and not well known among its practitioners. A case study is appropriate for resolving the problem. It is a qualitative approach which allows us to gain an understanding of the problem.

fig.1 Study Design



4.1.2 Units of analysis

The requirement engineers team is taken as a *case* as it involves their experiences and perceptions wherever necessary and *unit of analysis* in the research are the challenges faced by them for selecting approaches to automate requirement elicitation and ‘when’ to automate requirement elicitation.

4.1.3 Case Design

A multiple case study [14] is appropriate for conducting research as it enables the researcher to explore differences within and between cases. As different company’s employee different approaches for automation, data gathered will be collected from few case studies. We intend to predict patterns in the data and use it for further analysis.

Embedded approach [14] along with multiple case study is suitable in our case. In the embedded approach we pick the important aspects of the study and analyze the obtained information. For

example, if a company chose a model-based approach and another company chose a process-driven approach, the embedded case study helps in determining the challenges faced by the engineers in performing and working with the approaches respectively.

Practitioners perceptions are captured in an interview [12]. A questionnaire is formed which consist of open and closed end questions which help in collecting data regarding the practices, experiences and the challenges faced by them. Modifications in the questions can be performed based on the responses. In some scenarios, the interviews will be recorded if needed.

4.2 Data Analysis Method

For data analysis, Grounded theory approach [12] will be used which is a systematic methodology in qualitative data analysis.

The grounded theory approach is mainly based on 3 stages [12]

1. Finding categories
2. Identifying relations between them.
3. conceptualize and finding core categories.

To achieve those steps 3 types of coding are carried:

1. Open coding – Data is collected into various codes and these codes are categorized.
2. axial coding – Identify the relations between the categories by establishing a connection between open codes.
3. selective coding – main category is traced out and analyzed.

As Grounded theory method provides guidelines on how to identify categories, how to make links between categories and how to establish relationships between them. This is the reason behind choosing this approach.

Grounded Theory is built by making comparisons and asking questions about the data throughout the analysis [12]. It adds depth to the collected data. The grounded theory also provides a standard template for novice researchers for performing qualitative research[16]. Hence, grounded theory has been selected as appropriate analysis approach for our research.

4.3 Threats to validity

Threat: Respondents have little experience to answer the questions imposed by the interviewee.

Mitigation: The questionnaire must be framed with questions that are short and clear, such that they can be understood by experienced respondents.

Threat: Misinterpretation of the interview questions which might result in connectionless data.

Mitigation: We reduce the possibilities of misunderstanding by revising the questions framed with the supervisor.

Threat: Respondents might not give an honest answer.

Mitigation: Data obtained from individuals is kept anonymous.

Threat: Missing out on value-adding data while performing embedded case study method

Mitigation: Taking an advice from the domain expert.

5. EXPECTED OUTCOME

Based on aim and objectives of our research, on conducting the case study and analyzing the data using the grounded theory analysis method we expect to obtain the following results.

- A set of criteria which help in determining when to automate elicitation process.
- List of challenges that are experienced by the practitioners during the automation of requirements elicitation.

6. TIME AND ACTIVITY PLAN

The time and activity plan are presented below.

S.no	Activity	Start date	End date
1.	Choosing a research topic	2018-01-25	2018-01-27
2.	Identifying and formulating the research questions.	2018-01-27	2018-01-28
3.	Preparing and Submitting the research topic (Draft 1).	2018-01-28	2018-01-29
4.	Review Meeting. (1)	2018-02-01	
5.	Performing literature review and collecting the information from different sources.	2018-02-02	2018-02-07
6.	Transcribing the collected data.	2018-02-05	2018-02-08
7.	Analyzing data.	2018-02-09	2018-02-15
8.	Designing and formulating questions	2018-02-16	2018-02-18

9.	Preparing and Submitting intermediate research proposal draft (2) to the supervisor.	2018-02-19	2018-02-23
10.	Review meeting. (2)	2018-03-05	
11.	Modifications and Analyzing the document.	2018-03-06	2018-03-15
12.	Review meeting. (3)	2018-03-16	
13.	Editing and Documenting the final Research Proposal	2018-03-17	2018-03-21
14.	Submitting the final proposal report to the supervisor.	2018-03-21	

7. RISK MANAGEMENT

The below table describes the possibility of risk occurrence and mitigation plans to avoid them.

Risk	Probability	Description	Mitigation Plan
Time Constraints	Medium	All the research work may not be completed within the provided deadlines if it is not planned.	Planning and completing work systematically within the deadline by following the time plan.
Difficulty in assembling Team Members	High	It is not always possible to conduct meetings according to the schedule as the team members may be involved in other commitments.	Rescheduling the meeting by knowing each other availability beforehand and participating equally in the project.
Requirements Mislead	Low	In the process of work sometimes the instructions may be understood ambiguously.	Maintaining good communication between us and make sure that we acquired appropriate instructions.
Improper Citation	Medium	Team members might miss citing few sources which lead to loss of connectivity for further study	The citation must be done immediately along with the documentation.

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