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Requirement Engineering Practices in Pakistan Software Industry: Major Problems

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ABSTRACT

Requirement engineering is now an essential practice performed in almost every software manufacturing industry around the globe. It increases the amount of project success in a greater way. Sometimes this could be a labelled activity or sometimes not. However, almost every software development environment across the world is using some sort of basic requirement engineering process now days. The situation is not different in a developing country like Pakistan. A good number of software industries are following standard requirement engineering practices completely or partially. There are multiple reasons behind partial implementation such as lack of knowledge about processes, cost in terms of time and money and implementation of processes. In our study, we have collected factual data regarding current requirement engineering practices from Pakistan software industry. We have studied the organizations of varying size and types of projects. We also find out their success rate and problems which are due to partial or wrong implementation of requirement engineering practices. We are hopeful that this study will provide a cost effective solution for improving requirement engineering practices in Pakistan industry.

KEYWORDS: Requirement Engineering, Pakistan Industry, Current Practices, Problems, Parameters.

1 INTRODUCTION

Requirement engineering has shaped itself as a complete discipline now with a bundle of theoretical and practical application for software industry [1 - 4]. It has defined core activities like elicitation, analysis, specification, validation and management [2]. A comprehensive view of the field of requirement engineering is provided by Nuseibeh, B et al in [5]. They have presented an overview of the field along with its main areas of practice. They have also discussed the open research questions.

However, the field of requirement engineering starts from the elicitation of the requirements from client. What actually elicitation is described by the Davey, B et al in [6]. As per their opinion, elicitation is actually collecting the information from the client. However, the collection of requirements could place by using one way or the combination of multiple ways. The ways which are used for the elicitation of requirements are called techniques of requirement elicitation. Goguen, J et al have discussed the requirement elicitation techniques like interview, questionnaire, written material etc in [7].

The second major phase of requirement engineering is requirement analysis. As per Sommerville, I., & Kotonya, G analysis is concerned with discovering problems specially inconsistencies and incompleteness which are not been discussed by stakeholders [4]. It is actually a bridge between requirement elicitation and specification which is the next phase after analysis process. They have discussed various techniques for requirement analysis like prototypes and context diagrams. However, industry has adapted context diagrams especially unified modeling language as the standard one [8]. However, analysis phase always incur negotiation in it to resolve the issues. Ahmad, S in his work discussed the importance of requirement negotiation for analysis process, its stages and the conflict that are actually cause of error in requirements [10]. Negotiation in analysis is not taken as a low level

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activity by the research community. Criteria for negotiation meetings is being defined by In, H. P., & Olson, D in their work [10]. They have provided a framework which is very much useful while conducting requirement negotiation meetings.

The next step after analysis and negotiation is the preparation of specification document. Dorfman in his work has defined some rules for writing specification document, what should be the conventions and who should be the suggested readers etc are the questions being answered [11]. At this level of requirement engineering, some parts of the industry likes to write a complete software requirement specification document and some like some part of it like functional document only. However, there always exits some standard documents or templates which are being used by the people. These templates are being provided by some of the famous international standardization organizations like IEEE, ANSI etc.

In older days of software engineering, it was trend just to validate the system developed. However, the situation is completely different now. People have started validating the requirement document as well. They have defined techniques like reviews, inspections and prototypes etc for the validation of requirement document. Yousuf, F et al presented a survey of the some requirement validation techniques which are in practice by the industry [12].

The last and one of the critical step in requirement engineering is requirement management as it has always a greater cost in case of error detected. We all know that "there is nothing constant in the world except change" and change always has a price. There could be multiple reasons for the change. People have defined procedure for requirement change management. Leffingwell, D., &Widrig, D provided a complete study about the role of change management in the field of requirement engineering [13].

In recent days, all of the core requirement engineering activities are being modeled in form of documented processes implicitly or explicitly. Sommerville, I., &Kotonya, G and SHAMS-UL-ARIF et al has presented the process of requirement engineering which are built upon the core activities of requirement engineering [4, 14]. These models are from simple to complex ones. A study on in practice requirement engineering process models by the industry is provided by the Martin, S, et al [15].

As far as our study is concerned, we have find this loop hole that industry in Pakistan is very much annoyed from following requirement engineering processes or following partially. There are multiple reasons for it raised by the industry.

We have studied the current practices from industry, identified their problems and tried to suggest the solutions for it. We have divided our work into multiple sections. What are being the information collection parameters for us are discussed in sections 2. What are the current practices of industry are discussed in section 3 while major problems raised by the industry are the part of sections 4. Finally the discussion on our work and future dimensions has been presented.

2 Information Collections

Data collection and defining parameters for this process is very much important step in analysis research as it helps to identify problems and suggest solutions for those problems. Similar kind of study based upon factual data collected about offshore software development is performed by Akram, M. U et al in their work [16]. They targeted the teams/industry accomplishing offshore software projects and identified their requirement engineering problems. Also the requirement engineering practices for service-oriented system engineering, complex systems, electronic commerce, mobile information systems, agile development, web applications and software product lines are discussed in [17 - 23].

To the best of knowledge, the study of requirement engineering practices followed by the industry in a specific country is performed by Solemon, B et al and Zainol, A et al in [24, 25]. They have performed a survey of the current requirement engineering practices in Malaysian industry. In our case, we have taken Pakistan which has rapidly growing software industry.

As discussed above, we collected factual information from the industry as it was a basic required step for this type of research. There are various factors which directly or indirectly influences the implementation of requirement engineering practices in industry. We didn't forget to capture those. We targeted the organization with number of employees from low to high. We included the industry varying

in types of projects doing. We have interviewed and studied the documented procedures for the requirement engineering practices. In our interview process, we have been able to interview the employees from a developer level to chief operating officers. The discussion on each of the above three parameters is coming in the next sections.

2.1 Number of Employees

We have been able to visit the segmetns of industry varying in number of employees. It has been a very fruitful for us that industries having number of employees from 10 to 2500 or more. We have visited total 16 industries. This parameter will definitely highlight the similar and different deficiencies found at both extremes. To maintain the data integrity, we have provided labels to the organizations along with their size as shown in the Figure 1.

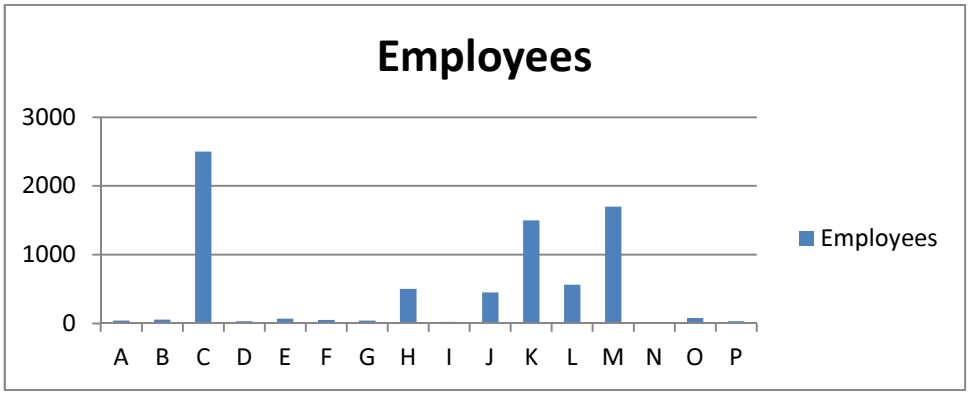

Figure 1: Organization and Their Size in terms of Employees

2.2 Type of Projects

Another major problem in successful and complete implementation of requirement engineering pracitces is the nature of proects. People have suggested specific requirementing engineering pratices for a certain type of projects which are greatly inspired by the nature of projects [16]. No use of thoese pratices is a major nichie in the project life cycle which will be discussed in later sections. For building understanding, we have presented a graphical repreesntation of the type and amount of projects which are accomplished by thesoftware industry in Pakistan in Figure 2.

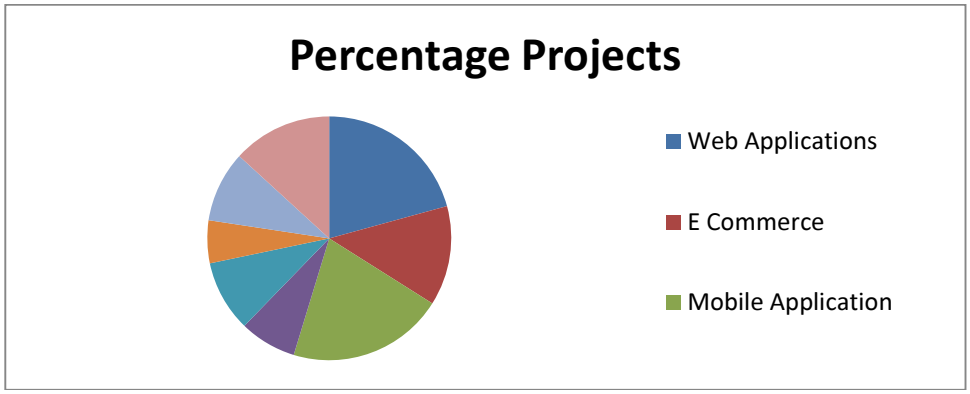

Figure 2: Types of Projects

2.3 Information Sources

This is very much important to know that who is directly or indirectly involved in the implantation of requirement engineering practices in an organization. Sometimes, it is performed by only one or sometimes by a group of people. This phenomenon varies from organization to organization depending upon the size of organization. As we discussed above, we have been able to interview the individuals from a developer level to chief operating/executive officer as shown in the Figure 3below.

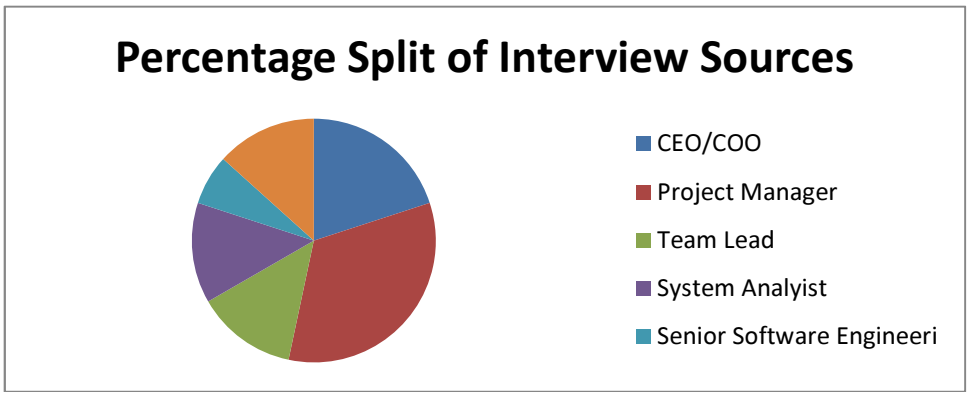

Figure 3: Percentage Split of Interview Sources

3 Current Practices

As far as the current practices of requirement engineering are concerned, very small amount of the industry in Pakistan is following requirement engineering practices completely. Most part of the industry is partially following the requirement engineering practices. We have made a study on current trends of requirement engineering practices in each segment of industry. We have taken fiver core activities of any requirement engineering model at one end while the trend of following a practice completely or partially on the other hand. We have presented our results in form of a graph in Figure 4. The graph shows that a particular industry is following a certain part or whole of an activity explicitly.

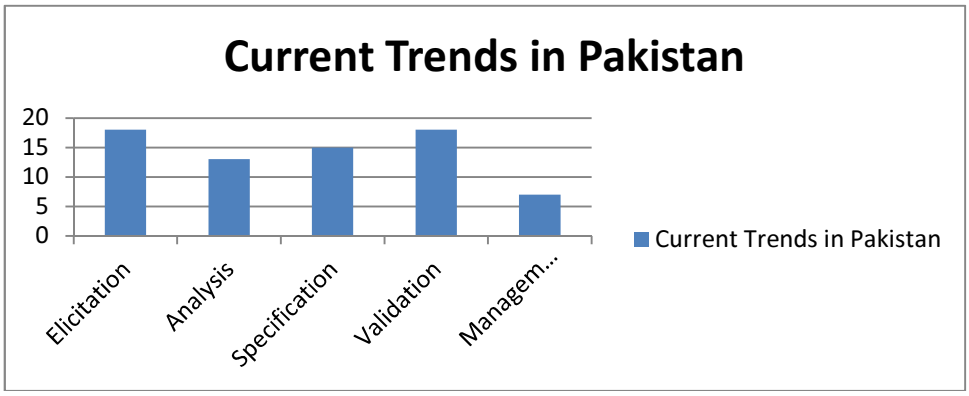

Figure 4: Current Trends of RE Practices in Pakistan

4 Major Problems Identified

One of the major contributions of our work is the identification of problems while practicing requirement engineering. These problems are raised by the representatives from software industry. We

have broadly discussed those problems in a categorical way. The categorical list of the problems identified is as follows.

- Unavailability of any type of written materials from client
- Management and support are the major problems
- Lack of knowledge about requirement engineering practices
- Lack of domain knowledge by the client
- Frequent change in requirements from the client
- Time and cost are major concerns while engaging the client
- Communication gap, language barrier and assumptions are the problems
- Need for the basic knowledge of client about automated systems
- Budget of client
- Employees left
- Partial or complete cancellation of Project
- Domain Validation errors
- Lazy attitude from the client
- Writing mistakes
- Lack of resources (Man effort)
- Ambiguities in natural language
- The use of agile project management approach [26]
- Conventional Vs formal method based approaches [27]

5 DISCUSSION & FUTURE WORK

Requirement engineering as discussed above has become an integral part of any software development organization. The country like Pakistan is also feeling the need of requirement engineering practices in their development culture. However, there are lots of hazards in the implementation of requirement engineering practices in Pakistan software industry. In our work, we have done a detailed study of requirement engineering practices in Pakistan industry on the basis of following parameters like size of Organization, types of project accomplished, the individuals involved in the implementation of requirement engineering practices directly or indirectly, explicit implementation of requirement engineering practices, major problems faced in requirement engineering practices and their success rate. We hope that these are the parameters which could be very much helpful in setting future dimension of requirement engineering practices for Pakistan's software industry. We have also plans to extend this work in future by incorporating agile development techniques followed by Pakistan's software industry. We will add more detailed parameters into our study. We are hope hopeful that those parameters will help a lot to suggest solutions for the problems identified. We have plans to present concrete solutions to those problems in future.

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