Effective Negotiations Practices in Global Software Development: A Systematic Literature Review

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Abstract — Proper negotiations and discussion play an important role during requirements collection and implementation for any software system. In Global Software Development (GSD), its significance increase more as stakeholders are far away across the globe. In GSD where critical challenges such as language differences, geographical distance, culture differences and time zone differences exist, thus need of effective negotiations become more increase. This study aims to identify possible practices from literature for implementing practices for effective negotiations and discussion among vendors and clients of GSD. To achieve goals, systematic literature review (SLR) is conducted to identify best practices for effective negotiations and discussion. Through SLR, 10 practices are identified.

Keywords - Practices, effective negotiations, Global Software Development, Systematic Literature Review.

I. INTRODUCTION

Requirement Engineering (RE) deals with all aspects of software requirements from requirements collection to requirements implementation in systematic and discipline way [1][2]. During elicitation phase of RE, requirements for software are collected using various elicitation techniques. Among these, traditional ways of techniques are background study, apprenticing, interview, questionnaire etc. [3]. Quality of any software depends on how well requirements are collected and implemented [4]. If the reason of software failure during testing is traced back to elicitation phase, then fixing changes will become very much costly [5]. Thus elicitation phase is considered to be the most critical phase of RE. Process of RE become more and more difficult during GSD as direct meetings of clients and vendors in GSD are difficult [6]. Due to geographical distance between client and vendors, importance of effective communication and global communication tools become more increase [7]. Due to challenges in GSD such as time zone differences and language barriers, effective and timely communication and proper discussion on requirements become more difficult [8]. As compare to local software development, GSD needs more and more attention so that proper discussion on requirements can be assured. With proper negotiations, any conflicts in requirements can be resolved on time. Systematic review is conducted by [9] to identify critical success factors during requirements implementation in GSD where effective negotiation and discussion is identified as critical success factor where 45 out of 92 studies reported this factor and focused on importance of effective negotiation and its impact.

The purpose of this research study is to identify best practices and solutions from literature through SLR. With these practices, proper and effective negotiation process can be assured. Thus with effective negotiation, successful RE and requirements implementation can be possible.

II. BACKGROUND STUDY

Language is very essential in requirement collection as it disturbs transfer of knowledge and proper communication that depends entirely on appropriate usage of language [8][10]. In GSD this factor is a big challenge because mostly the clients and vendors face difficulties to fully cope the terminologies of other languages [11]. In GSD, timely communication is another big challenge because there exist difference of time zones between two countries and sometimes this variation in time zones can increases that makes it difficult to communicate synchronously such as video or audio calls etc [12][13]. Time zone variance is a challenge for both vendors and clients in GSD and thus it requires appropriate solutions and practices [14][15].

Elicitation problems occur due to lack of proper communication and for which model is suggested in one of the studies [16]. The first step in this model is to arranged interviews from several software industries and compare the consequences with outcomes as identified by research group. Theoretical modeling of requirements uncertainty and elicitation dimensions is the next step and the last step is the validation of model from different software organizations.

Communicating knowledge and information's in GSD is challenging and a big challenge in GSD [17]. Poor SRS shows that the knowledge managing was improper [18].

Proper discussion and negotiation on requirements in GSD is an crucial challenge to be overcome and but due to the stated challenges such as time differences, language barriers and culture differences it is quite difficult to have proper negotiations on requirements [19][20]. Trust should be established in GSD because without trust no team is possible and without team no collaboration is possible and without collaboration and trust a success is achieved only by luck [20].

Different implementation models has been for efficient requirements implementation in the context of GSD. Requirement Implementation Model (RIM)[21], Requirement Elicitation Model (REM) [22] and Requirement Management Model (RMM)[6] are presented in different studies. The proposed models are based on empirical studies that will consist of all possible challenges and success factors with practices and solutions during requirements implementation, elicitation and management in context of GSD.

III. RESEARCH METHOD

SLR is conducted to achieve our goals and objectives. In our previous studies we used the same research method to achieve other goals [23][24]. In this research study, we are repeating the same steps as we did in our previous research works. The step by step approach of conducting SLR is shown in Figure 1.

a. Research Question Identification

The first step of doing SLR is finalizing research questions. Based on particular research question, data are retrieved from different research studies. We have finalized the following research question (RQ1) for this study.

RQ1: What are possible solutions and practices for effective negotiations and discussion during successful requirements collection in GSD?
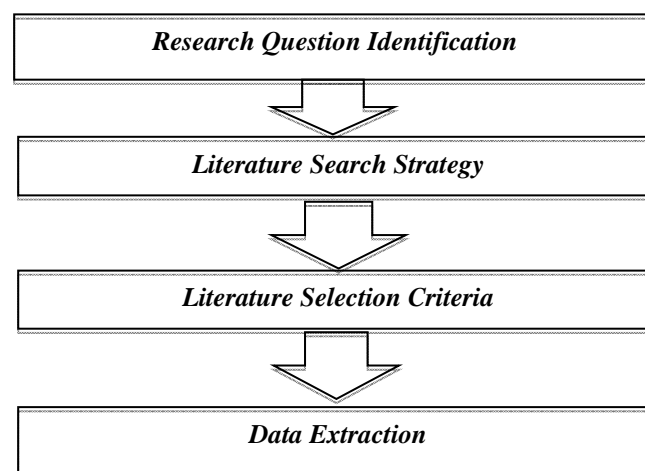

Figure 1. Development Process for the SLR Protocol

b. Literature Search Strategy

Literature Search strategy is made that consist of the following;

- **Range of search (time and space)**

There is no bound on search time and space. Publication related to our defined RQ1 will be included for the next step.

- **Electronic data sources used**

We will used Science Direct, Springer link, ACM portal, IEEE Xplore.

- **Strings for the search**

We have used the following search string for this research work.

 (("Requirement Engineering" OR "Requirement Implementation" OR "Requirement Elicitation") AND ("Global Software development" OR "Distributed Software Development")).

c. Literature Selection Criteria

During literature selection criteria, not all but some publications that are most relevant to research question is selected for final data retrieval. Studies that are not written in English will be excluded from final list of papers. Inclusion and exclusion criteria for this research study is based on RQ1. Papers that address practices for effective communication in GSD will be only included.

d. Data extraction

This is last phase where practices for effective negociations during requirements implementation in context of GSD will be retrieved from final selected list of publications.

Based on inclusion and exclusion criteria, Table 1 shows number of primary and final selected papers from different digital resources.

Publisher Site	Total Results found	Primary selection	Final Selected Papers (Appendix)
IEEExplore	360	85	14
Science Direct	300	85	4
ACM	280	40	3
Others	430	105	7
SpringerLink	140	20	2
TOTAL	1510	335	30

IV. RESULTS

After conducting SLR, following 10 practices for effective negotiations during requirements implementation in GSD as shown in Table 2 are identified.

Table 2: Practices for effective negotiations in GSD

S/No	Practices/Solutions	% of Practices via SLR (N=30)
1	Video channels	5
2	Advance Collaborative tools for GSD should be used	10
3	Asynchronous means of communication	5
4	Human facilitation of distributed requirements negotiations	1
5	Schedule ongoing informal meetings	4
6	Clear escalation path. It has to be clear whom to talk to when things go wrong.	4
7	collaboration and coordination is required	1
8	Focus on interests rather than positions	1
9	Knowledge management techniques in distributed structures	1
10	Hard-copy documents such as the RS are used as vehicles for discussion and decisions	1

- With video channels, face to face discussion on requirements among clients and vendors can be possible. Video channels help to direct discuss conflicts and misunderstandings on requirements in less amount of time. Video channels increase remote collaboration of stakeholders and trust level in them.

- As due to time zone differences or difficult to understand each other's language in GSD, synchronous ways of communication such as video channels are not possible and thus use of asynchronous ways of communication such as emails, fax etc. become more useful. With this kind of communication, clients and vendors get enough time to discuss on requirements. They gets enough time to understand each other's terminologies during discussion due to language barrier.

- In several studies, advance tools for GSD are suggested that contains facility for requirements collection and analysis. Use of such tools helps in reducing barriers during successful requirements negotiations.

- Arranging informal meetings and developing personal relationships in GSD helps in reduction of challenges in GSD such as culture differences. Informal meetings increase coordination and thus helps in reducing effect of challenges during effective negotiation process in GSD. Arranging informal meetings of team members inside organization is also necessary and thus helps in effective negotiation.

- In GSD, clear escalation path should be defined by project managers so that any wrong thing or difficulties can be discussed with focal or experienced person inside organization. Domain of effective negotiation is not limited only to clients but inside organization, more and more fruitful discussion on requirements is very helpful and necessary.

- While discussing requirements, more and more collaboration is required so that terminologies of each other's in GSD can easily be understood. In GSD where culture issue is barrier among clients and vendors, thus more and more collaboration is needed for proper discussion on requirements.

V. CONCLUSION AND FUTURE WORK

As a result of SLR, 10 practices are identified for effective negotiations in GSD. In these practices, Use of advance collaborative tools for GSD, Video channels, Asynchronous means of communication and Schedule ongoing informal meetings are identified as most critical and cited practices. In future, we aim to validate these practices through industrial surveys and explore some new practices that are not previously identified from literature.

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