Software Outsourcing Quality Challenges Model Systematic Literature Review (SLR) Protocol

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Abstract: Today software outsourcing becomes a common tradition for business industry to enhance their business by hiring high qualified staff and lowering their expenses. In spite of fact several edges of software outsourcing there are various factors that affect the quality of software outsourcing. The main purpose of this protocol is to find out those barriers that affect the quality of software development outsourcing from vendor's perspective. Systematic Literature Review (SLR) will be used to discover all those barriers that impact the quality of software outsourcing from vendor perspective. The expected outcome of this review will be find out those barriers that affect the quality of software development outsourcing and also assist vendor organizations to handle software outsourcing quality (SOQ) issues. The ultimate goal of this protocol is to develop Software Outsourcing Quality Challenges Model (SOQCM).

Keywords: Systematic Literature Review, Software outsourcing; quality; quality challenges; practices; outsourcing vendor;

I. INTRODUCTION

It is a matter of fact that modern world has entirely changed into global village with the help of fast and effective communication. There are numerous advantages of globalization; one such advantage is that it has built up an environment of competition among various business corporations. Business corporations' want more and more profit in short span of time; so they reduce their wage cost and contracted highly skilled staff and this can be only possible when they follows offshore development or outsourcing.

Now a days, in IT world software outsourcing becomes a general norm. Zada Islam et al. [1] explains the term software outsourcing as to adopt such practices in which a developer or a team of developers in abroad to perform some tasks or provide services. Today in businesses, offshore software outsourcing is becoming the vital strategic approach and its rate is increasing day by day [2]. There is difference between the terms offshoring and outsourcing, though they are used in the same context. In offshore a company shifted their services and manufacturing activities abroad to their own affiliated or unaffiliated firms [3]. In outsourcing for services and manufacturing activities are hiring or contracting out to unaffiliated firms, which may be existed locally or in abroad. [3]. For offshore software development (OSD) the term Distributed or Global Software Development (GSD) may be used [4].

Famous American Author and Software Engineer Boris Beizer [5] said about software quality that in past software was not perfect and it will be impossible to get a perfect software. It does not mean that we create a piece of garbage. So when developing a software we should focus on quality.

Quality software development refers to develop such software that can fulfill the customer requirements. The main reason behind software failure is poor quality development In Offshore Software Development Outsourcing (OSDO) Quality software development is always a great challenge.

In software engineering; today quality is the most challenging issue. Each person looks quality from his own angle. Intended or desired outcome is the precise definition of quality. While in terms of software engineering, quality can be concisely defined as to satisfy or fulfill stated needs of a customer. Quality is comprehensively defined by IEEE as the degree to which a system, component or process fulfill stated requirements [6]. Life cannot be imagined without software system, because it has become the part and parcel of our life.

II. LITERATURE REVIEW

Quality is always considered a challenging issue in offshore software development outsourcing or GSD. There are a lot of reasons that affect the quality of software development outsourcing.

The first and foremost reason is poor requirements, requirements gathering from customers in GSD is a very difficult job [7]. Requirements gathering from customers in software engineering is the first step for developing of a software. Requirements gathering from customers is not an easy task in Software Outsourcing Development (SOD) as compare to in-house software development. Neetu et al. [8] also stressed on this fact that good quality requirement is turning point of a project. It means good quality requirements make a project successful.

It is a true fact that only by sharing we can increase our knowledge and without sharing it has no significance. Level

of trust only grows when we share knowledge which is the most powerful Sharing of knowledge grow up level of trust, which is the most influential tool for building healthy relationships in every walk of life. Once trust is built up then it creates commitment, which ultimately raises the morale of teamwork and this teamwork finally helps in achieving goals. Kumer and Thangavelu [9] have discussed the factors that hugely impact the outcome of GSD projects are knowledge sharing, trust and commitment.

There are numerous challenges regarding quality management in software outsourcing, which has been pointed out by different research scholars. Bartelt et al. [10] argued that establishing proper co-ordination in software outsourcing is the main challenge. Gopal et al. [11] also argued software quality improves due to co-ordination between client and vendor but due to this co-ordination development speed may not be increased. In Mishra [7] opinion for proper co-ordination vital thing is communication. Iqbal J et al.[12] considered lack of proper communication between clients and vendor the most significant risk for failure of IT outsourcing projects.

Erran et al. [13] indicated that offshore software outsourcing quality is also affected by language. In most offshore software outsourcing contract countries English is not their main language. A lot of problems are created during requirements gathering due to this language issue.

Mishra et al. [14] pointed out that issues such as knowledge transferring, requirements gathering, communication and collaboration are created due to culture difference.

Yu et al.[15] showed that difference in time zones creates drastic complications in global software development. Erran et al., [13] agreed to the fact software quality is highly affected by this time zone difference.

In fact distances always create severe complications. Ali et al. [16] considered that Geographical, Temporal and Socio-culture are the three types of distances which affects quality of software outsourcing.

Tracy et al. [17] stated the quality of product and project success is damaged due to the developers and other high staff turnover rate. Li et al. [18] also investigated that high turnover of staff especially developers massively affect project success. Niazi et al. [19] studies showed that understanding project management problems before starting the development is essential for successful GSD projects. Jain et al. [20] also emphasis on this fact improper management is the key factor due to which GSD project fails.

As we have found through literature review that quality software development plays an important role in OSDO. There are various challenges identified by the different researchers as mentioned in their articles that lack of quality software development lead toward software failure. We have found that there is no such model exists using SLR to mitigate quality challenges from vendor perspective for OSDO.

III. SYSTEMS LITERATURE REVIEW PROTOCOL (SLR)

For development of protocol we have studied different Systematic Literature Reviews [21, 22]. The main objective of this paper is to develop the SLR protocol for Software Outsourcing Quality Challenges Model (SOQCM) in light of Kitchenham guidelines [23]. According to Kitchenham [23] there are three phases of Systematic Literature Review (SLR); planning, conducting and reporting. The focus of this paper will be planning phase. This review will help to conclude quality related challenges in the field of software outsourcing. This review is totally based on research questions. After finalizing our research question we will trial search on different databases and for this purpose we will define some strings. After searching we will specify inclusion and exclusion criteria for the literature and data will be extracted. Then after data extraction process phase data will be synthesized in tabular form.

IV. RESEARCH QUESTIONS

The main purpose of our protocol is to address the following three research questions:

RQI. What are the quality challenges faced by the vendor organization in offshore software development outsourcing from vendors' perspective?

RQII. What are the practices as defined in the literature used for avoiding the software development quality challenges faced by the vendor organization?

RQ3: What are the real world practices used for avoiding the software development quality challenges faced by the vendor organization?

V. SEARCH TERM CONSTRUCTION

The following details show that how the search term construction i.e. intervention, population, outcome takes place. Table I shows the general form of search terms construction.

TABLE I. GENERAL FORMAT FOR SEARCH TERMS CONSTRUCTION

Intervention	Challenges, barriers, issues, problems
Population	Software outsourcing, vendors
Outcome	Good quality software, High quality software

Table II and Table III shows details of search terms construction for RQI and RQII respectively.

TABLE II. RQI SEARCH TERMS CONSTRUCTION

Intervention	What are challenges faced by the………..
Population	vendor organization in offshore software.....from vendors 'perspective?
Outcome	quality……

TABLE III. RQII SEARCH TERMS CONSTRUCTION

Intervention	What are the practices as ……challenges
Population	defined in the literature……by the vendor organization.
Outcome	avoiding the software quality

VI. SEARCHING STRATEGIES

A. Trial Searching

Initially, we have built up a search string to perform trial search on different resources i.e. IEEE, Google Scholar, ACM and SpringerLink.

"Software outsourcing" AND Quality OR "Software quality" AND Challenges OR Barriers OR Problems

The results of initially built up string was not satisfactory, so later on develop another string which is disused in section **VII-A** of this paper.

B. Characteristics of Search Terms

For construction of search terms or strings the following approach will be followed.

a. From research questions identifies major terms for population, intervention and outcome.
b. Use alternative synonyms and spelling for major terms.
c. Find out the key words in relevant papers.
d. For conjunction purpose use Boolean operators in such a way that major terms are connected through 'AND' operator while alternative terms are connected through 'OR' operator.

1) Output of a

RQI: Software outsourcing, vendors, challenges, quality.
RQII: vendor, practices, challenges, software quality.

2) Output of b

RQI:
Software Outsourcing: "Software outsourcing" OR "Software subcontracting" OR "software farm out" OR "software commissioning" OR "software contracting" OR IT outsourcing OR "software hiring" OR "IS outsourcing"
Vendors: Vendors OR suppliers OR contractors OR sellers OR hawkers OR traders OR brokers OR marketers
Challenges: challenges OR barriers OR problems OR issues OR complications OR risks OR experiments OR tests OR encounters OR tasks OR trails
Quality: quality OR value OR worth OR feature OR class OR superiority
RQII:
Vendor: vendor OR contractor OR marketer OR supplier OR hawker OR broker OR sellers OR trader
Practices: practices OR rehearses OR does OR performs OR follows OR procedures OR methods OR manners OR conventions OR exercises
Challenges: challenges OR problems OR complications OR issues OR barriers OR trails OR tasks OR encounters OR tasks OR tests OR experiments OR risks
Software Quality: "software quality"OR"software value" OR "software excellence"OR"software worth" OR "software feature" OR "software class" OR "software eminence" OR "software characteristics" OR "software caliber" OR "software blue-ribbon"

3) Output of c

Software outsourcing, IT outsourcing, IS outsourcing, software quality, software quality issues, software outsourcing risks, global software development quality, outsourcing challenges, outsourcing barriers, offshore software outsourcing, software outsourcing barriers.

4) Output of d

RQI:
(("Software outsourcing" OR "Software subcontracting" OR "software farm out" OR "software commissioning" OR "software contracting" OR "IT outsourcing" OR "software hiring" OR "IS outsourcing") AND (vendor OR suppliers OR contractors OR hawkers OR broker OR marketers) AND (challenges OR barriers OR problems OR issues OR complications OR risks OR experiments OR tests OR encounters OR tasks OR trails quality OR value OR worth OR feature OR class OR superiority))
RQII:
((vendor OR contractor OR marketer OR supplier OR hawker OR broker OR sellers OR trader) AND (practices OR rehearses OR does OR performs OR follows OR procedures OR methods OR manners OR conventions OR exercises) AND (challenges OR problems OR complications OR issues OR barriers OR trails OR tasks OR encounters OR tasks OR tests OR experiments OR risks) AND ("software quality" OR "software value" OR "software excellence" OR "software worth" OR "software feature" OR "software class" OR "software eminence" OR "software characteristics" OR "software caliber" OR "software blue-ribbon"))

VII. SEARCH STRING PROCESS

A. Search String Development

On the basis of discussion for RQ1 and RQII in previous section **VI–B-4** of this paper develop a search string to perform search operation on different libraries or databases i.e. Google Scholar, IEEE, Springer Link and ACM. We develop a single string for both Research Questions RQI and RQII because some libraries i.e. IEEE does not permit lengthy string. Other reason for developing single string to save our time because searching is very tedious and time consuming process. The search string for RQI and RQII is given below:
(("Software outsourcing" OR "IT outsourcing" OR "IS outsourcing") AND (quality OR value OR feature) AND (challenges OR barriers OR problems OR risks) AND (practices OR solutions OR methods) AND (vendor OR suppliers OR contractors))

B. Resources to be Searched

After finalization of search string; search is conducted on different resources / databases.

- Google Scholar
- IEEE
- SpringerLink
- ACM

The search results of above mentioned databases are shown in Table IV.

TABLE IV.   SEARCH RESULTS OF DIFFERENT DATABASES

Name of Database	Search Result
Google Scholar	16700 (980 access)
IEEE	281
Springer Link	9916
ACM	211
Total	27108

VIII.   SELECTION OF PUBLICATION

Initially, primary selection of publication took place which purely basis on title of paper, abstract of paper, and keywords of paper. The search results for primary selected papers are shown in Table V.

TABLE V.   PRIMARY SELECTED PAPERS RESULTS

Name of Database	Search Result	Primary Selection
Google Scholar	16700 (980 access)	299
IEEE	281	58
Springer Link	9916	157
ACM	211	4
Total	27108	518

After primary selection; final selection of publication will take place which base on reading full text and checking against inclusion and exclusion criteria describe on **VIII-A** and **VIII-B** section respectively of this paper.

A. Inclusion Criteria

Inclusion criteria define which part of the literature will be used for data extraction process. Our criteria for inclusion is based on the study of
- Software outsourcing
- Barriers that Software outsourcing quality
- Quality related issues of Software outsourcing from vendor perspectives
- Global software development quality related problems
- Solutions for quality related issues of software outsourcing from vendor perspectives

Moreover, we include only those research papers which are in English language and match its title, abstract and keywords with our search string.

B. Exclusion Criteria

The purpose of exclusion criteria that which part of literature will not be used for data extraction or ignored. Our criteria for exclusion is solely based on the study of
- not relevant to software outsourcing
- not match with research questions
- not match title with search string
- not match abstract with search string
- not match keywords with search string
- not fulfill the criteria of software outsourcing quality related issues
- Research papers which are in other languages not in English language

C. Secondary Reviewer Support

As far as, primary sources selection is concerned it is totally based on just reviewing the title of paper, abstract of paper and keywords. For final selection of papers just to check the results against the specified criteria of inclusion and exclusion. If there is any uncertain situation regarding inclusion / exclusion criteria then the secondary reviewer is requested to review the data.

IX.   ASSESSMENT OF PUBLICATION QUALITY

The quality of publication will be assessed after the final selection of publications which will be performed in parallel with Data Extraction phase. The quality of publication will be purely based on the following questions:
- Has author clearly identified those challenges which affect software outsourcing quality?
- Which practices are adopted by author to take down these challenges?

After reading research paper the above mention questions will be marked as Y or N. Moreover, for validation purpose secondary reviewer will also take part in scoring of small subset.

X.   DATA EXTRACTION PHASE

A. Commencement of Data Extraction Phase

Data Extraction Phase will be started after studying of Primary Selected Publications and it will totally emphasis on satisfying the research questions.   The following data will be extracted during data extraction phase.
- Detail of Publication i.e. Title of Paper, Name of Authors, Reference Type i.e. whether it is Conference Paper / Journal Paper, Name of Journal, Name of Conference, Volume of Journal, Issue of Journal, Conference Location, Year of Publication, Pages etc.
- Data that is related to research questions i.e.
For RQI background information and as well as such challenges / barriers / issues will be identified that affect the software outsourcing quality.
For RQ2 background information and those practices / solutions related data will be extracted which compete those challenges affect quality of software outsourcing.

B. Extracted Data Presentation

The extracted data will be presented in the following prescribed format as shown in Table VI.

- Date of Review
- Title of Paper
- Authors of Paper
- Conference / Journal Name
- Name of Database / Resource
- Methodology (i.e. Interview, Survey, Case study, Report etc.)
- Quality of Publication Description
- Organization Type (i.e. Software House, University, Research Institute etc.)
- Company Size (i.e. small, medium, large)
- Country (i.e. Location of Analysis)
- Year
- Challenges (i.e. identifies those barriers / issues which impact software outsourcing quality)
- Practices (i.e. which are adopted by different outsourced organizations in order to cope with challenges)

C. Data Extraction Process

For initiation of data extraction phase, the primary reviewer will be solely responsible. Secondary reviewer will provide guidance; if primary reviewer faces any difficulty during the process of data extraction. The primary reviewer will extract data from primary selected publications one after another. The secondary reviewer will also contribute in data extraction process and select randomly those papers from which primary reviewer have already extracted data. The secondary reviewer selection will be totally independent; its sole purpose will be just to compare his extracted results with primary reviewer results. In case of any mismatch of primary reviewer results with secondary reviewer results, secondary reviewer will properly guide primary reviewer.

D. Data Storage

After the process of data extraction it will be summarized and also kept in form of SPSS document. Moreover, it will be also stored in local drive of Department of Computer Science University of Science & Technology Bannu.

XI.   DATA SYNTHESIS PHASE

In data synthesis phase there will be categorization according to the number of research questions i.e. as there are two research questions so there will be two categories in data synthesis phase. For RQI there will be two tables i.e. one table will contain background information while other table will consist of those challenges which affect quality of software outsourcing. In the same way for RQII, there will also 2 tables i.e. one will consist on background information while table will consist on those practices / solutions that are suggested in Systematic Literature Review to cope these challenges.

XII.   DATA REVIEW PROTOCOL

For review purpose this protocol will be submitted to secondary reviewer (Supervisor), Dr. Abdul Wahid Khan for his kind recommendations.

XIII.   TIME FRAME

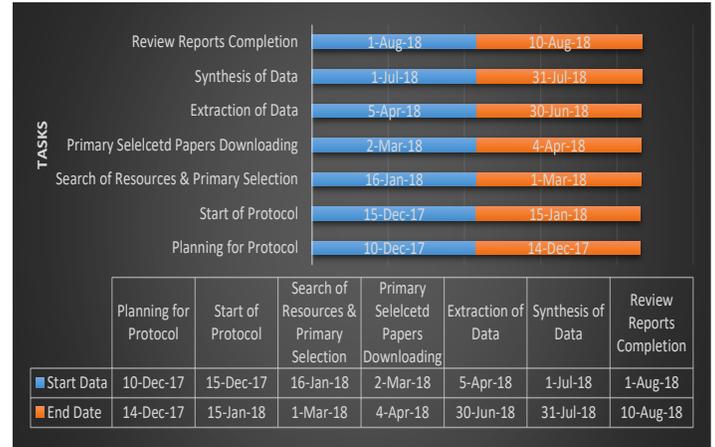The following Gantt chart visualizes the time frame of each task:

Figure 1. Time Frame

XIV.   LIMITATION

As far as limitation is concerned, for real world practices RQIII (i.e. questionnaire survey, interviews etc.) will be developed. Moreover, Google Scholar shows 16700 search results out of which only 980 records are accessible.

XV.   FUTURE WORK

This SLR protocol is the first step in developing of Software Outsourcing Quality Challenges Model (SOQCM). As previous SLR study shows that no such model has yet been develop that address Quality related challenges in software outsourcing. Next step is to synthesize also those challenges which affect quality and also practices which are adopted to take down these challenges from SLR.

XVI.   REFERENCES

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