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Research Article

Solutions for Critical Challenges in Offshore Software Outsourcing Contract

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Abstract: Software outsourcing is a contract based relationship between client and vendor organisations, where the client organisation makes a contract for all or part of software-development activities with the vendor organisation(s) that provide agreed services in return for remuneration. Efficient outsourcing contract can yield in successful outcomes of the outsourced projects". In our previous work we have identified nine critical challenges (e.g., 'lack of project management', 'poor monitoring system', 'lack of outsourcing relationship management', 'culture and linguistic issues', 'non-competitive price', 'IPR and regulatory issues', 'failure to manage end-users expectation', 'lack of negotiation strategies' and 'unforeseen contingencies') faced by vendors in managing and execution of offshore software development outsourcing (OSDO) contract. In this paper, our research methodology is composed of both empirical study in OSDO industry and systematic literature review. Based on the aforementioned two well-known methodologies we have identified 91 practices/solutions in total to assist vendor organizations in addressing these nine critical challenges. Implementation of the identified practices will assist in avoidance/mitigation of the critical challenges faced by vendors in management and execution of OSDO contract.

Keywords: Offshore software outsourcing contract, vendor, practices/solutions, empirical study, systematic literature review (SLR)

1. INTRODUCTION

Offshore software development outsourcing (OSDO) is a Global Software Engineering paradigm for developing high quality software at low cost in low-wages countries. Furthermore, software outsourcing is a contract based relationship between client and vendor organisations, where client organisation contracts out with vendor organisation to get high quality software [1]. Outsourcing contract is an agreement between outsourcing vendor and client organisations for the purpose of developing high quality software. Goo et al [2] stated that outsourcing contract management is considered as an important factor in the sensation of any outsourcing project. Efficient management and execution of the outsourcing contract can lead to the successful outcomes of OSDO relationship. However contract management in OSDO relationship bears a number of challenges. We have already identified a number of critical risks confronted by vendors in the management and execution of outsourcing contract [3]. These critical challenges are presented in Table 1. The goal of this work, described in this paper, is to investigate practices/solutions for the identified critical challenges in OSDO contract management from vendor's perspective.

Table 1. List of critical challenges of outsourcing contract management.

CC#	Critical challenge
1	Lack of project management
2	Poor monitoring system
3	Lack of outsourcing relationship management
4	Cultural and linguistic issues
5	Non-competitive price
6	IPR and regulatory issues
7	Failure to manage end-user expectation
8	Lack of negotiation strategies
9	Unforeseen contingencies

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1.1 Software Outsourcing

Software outsourcing is a Global Software Engineering (GSE) paradigm being actively practiced from the last two decades. Software outsourcing is categorized into offshore outsourcing, nearshore outsourcing and onshore outsourcing based on the geographical distance between the stakeholders involved. Offshore software development outsourcing (OSDO) is practiced by many organisations in the developed countries for developing a high-quality software in far flung developing countries at low cost [1]. "Software outsourcing has grown quickly and provides new shape to business process [4]. Majority of US and UK software firms tend towards OSDO due to high-quality software development at low cost [5]. The well-reputed software outsourcing vendors are located at India, Ireland, China and Russia, whereas the client's countries are United States, United Kingdom and Japan [6]. It has been observed from the literature review that most of the CMMI level five companies" belong to India [7].

1.2 Software Outsourcing Contract

Software outsourcing relationship is based on a formal contract that is referred to as outsourcing contract. Khan et al [1] have stated that a good contract management can produce the desired outcomes from the outsourcing projects. A good contract directs toward achieving ultimate goals and mitigates the imminent issues which, lead toward the project failures [8]. Outsourcing contract may be bifurcated into pre-contract and post-contract for the best management of contract implementation [8]. A good contract relationship direct to achieve client trust which, is possible through managerial attention [9].

Software outsourcing contract management plays an important role between client and vendor organisations in software development outsourcing relationship. A poor contract leads toward failure of outsourcing project. To identify the challenges of outsourcing contract and its practices we have formulated the following research questions.

RQ 1. "What are the barriers/risks/challenges to be avoided by vendor organisations at various stages (pre-contract, during-contract and post-contract) in order to design and implement an effective offshore software development outsourcing contract?"

The findings of the RQ1 have already been published in our previous work [3].

RQ 2. What are the practices/solutions, to be adopted by OSDO vendors, for addressing the critical challenges/risks in offshore software development outsourcing contract management?

2. BACKGROUND

"Software outsourcing" is a contract based relationship between the client and vendor organisations where, the client organisations contract out all or part of software-development activities to the vendor organisation(s) and the vendor organisation(s) provides the agreed services in return for remuneration [1]. Software outsourcing has turned into a key supply-chain management practices, where boost in globalization has altered and advanced society to outsource essence and non-essence operational and other activities to nearshore and offshore locations [10]. Outsourcing has become a key practice of supply-chain management, but it has been proven to be hard to manage [11].

Efficient outsourcing contract management can play a vital role for achieving the planned goals and successful relationships between the software outsourcing parties [12]. Contract management has been described as a pivotal factor in the success of outsourcing projects [2, 13]. A well defined contract can ease strategic challenges [14]. The significance of contract is highlighted by contract theory in context of risk behavior of suppliers [13]. Poppo et al [13] stated that "the more complete the contract, the greater the specification of promises, obligations and actions for dispute resolution, which in turn limits the scope for opportunistic behaviour".

According to Popoo et al [13] the award of extra incentives can manage the poor performance of suppliers' products and services regarding contract management. Incomplete contract can be managed through a well-defined and well-documented complete contract and this can mitigate the contract risks such as environment change, poor communication and cultural differences [13]. Complete contract perform two functions such as control and coordination, where the control reduces the single and aberrant behaviour and coordination establishes a linkage among various units [15].

As usual, software outsourcing contract is not a risk-proof activity. Dum and Bradstreet [16] "have conducted a global survey and have found that 50% of the outsourcing projects failed due to poor contract management". We have identified, in our previous work, various critical challenges in the context of OSDO contract management from vendor's perspective [3], such as 'lack of project management', 'lack of outsourcing management', 'cultural and linguistic issues, 'non-competitive price', 'IPR and regulatory issues, 'lack of negotiation strategies, 'unforeseen contingencies', 'poor monitoring system' and 'failure to manage end-user expectations'.

It has been reported in the literature that majority of studies are focused on challenges of global software engineering management rather than identification of solutions/practices or techniques [17]. Hosain et al [18] have identified, through systematic literature review (SLR), the scrum practices in the context of global software development (GSD).

The literature review reveals that most of the work has been done in software outsourcing on challenges' identification but there is no sufficient literature on solutions of these identified challenges. This paper contributes in identification of solutions/practices for addressing the critical challenges faced by vendors in the management and execution of OSDO contract.

3. STUDY DESIGN

Our findings are based on the following two research methodologies:

- Systematic literature review (SLR)
- Questionnaire survey

First, we conducted SLR to identify the solutions/practices for the identified critical challenges. Secondly, we conducted questionnaire survey in OSDO industry to validate findings of the SLR and to find any new practice/solution apart from the identified ones. Details are given in the following sections.

3.1 Systematic Literature Review

"Systematic literature review (SLR) is a mean of investigating, evaluating and interpreting the existing relevant literature for some specific research question(s) in a more systematic way based on a pre-defined protocol that is aimed to reduce biasness. SLR is a secondary study and is more thorough than ordinary literature review as it is composed of three major phases", i.e., planning, conducting and reporting. [19].

We first conducted SLR process [19, 20] for the identification of practices for critical challenges in OSDO contract. We have developed the SLR protocol [21] where we have defined our search string, the relevant resources/on-line libraries to be searched, the inclusion and exclusion criteria, publication selection criteria and data extraction process.

The search terms conceded 114 research articles in primary selection in various digital libraries but after final review based on the inclusion/exclusion criteria, only 84 publications were selected as shown in Table 2. The inclusion and exclusion criteria were used to select the most relevant articles to the research question.

Table 2. List of publication selection.

Digital libraries	No. of publications	Primary selection	Final selection
IEEEXplore	148	49	38
ACM	70	02	02
ScienceDirect	1000	48	34
CiteSeerX	342	00	00
Google Scholar	88	15	10
Total	**1648**	**114**	**84**

We have searched the following digital libraries:

"IEEE Xplore (http://www.ieeexplore.ieee.org/Xplore/guesthome.jsp)

ACM Portal (http://www.dl.acm.org/)

ScienceDirect (http://www.sciencedirect.com)

CiteSeer Digital Library (http://www.citeseer.ist.psu.edu)

Google Scholar (http://www.scholar.google.com)"

Details of the inclusion/exclusion criteria and data extraction form are given in the protocol [21] and can be provided by the authors on request.

3.1.1 Data Synthesis

After completion of the data extraction phase, the data synthesis were performed by both reviewers (the authors) based on the predefined procedure. Initially we identified 124 practices in total. These were further reviewed and some of them were grouped together to form 119 practices in total. Finally, we found 91 practices after external review. These practices were validated through external reviewer. The changes were addressed as suggested by the reviewer. Finally, we have polished these groups and set these groups of practices across the identified critical challenges.

3.2 Questionnaire Survey

After conduction of the SLR, we conducted empirical study in outsourcing industry to validate findings of the SLR and to find any new practice apart from the identified ones. According to Kitchenham and Pfleeger [22] a survey research method is suitable for collecting self-reported qualitative and quantitative data from a huge number of respondents. A survey can be used for collecting data by using different techniques such as interview, questionnaire survey and others [23, 24]. Questionnaire survey is an empirical method use for collecting qualitative data from industry experts about some specific research area. We have preferred to use questionnaire survey for data collection due to various reasons such as collecting data from diverse range of respondents and accessible resources.

A questionnaire survey was designed based on our previous literature findings and followed the format used by other researchers [25-27]. For self-reported data collection a closed format questionnaires has been used in this research work. We have also included open ended questions in questionnaire survey to collect the tacit knowledge from the industry experts apart from the identified practices for critical challenges. This kind of survey assists to mitigate the risks of biasness relating to the researchers preconceptions and it encourages the participant to keep talking about a particular subject [28].

3.2.1 Data Collection

In this study we have tried to explore the experiences and viewpoints of software industry through our developed questionnaire. This study is considered qualitative in nature. Qualitative research method is pertained with studying objects in their natural setting [29]. Creswell [30] stated that "a qualitative researcher attempts to interpret a phenomenon based on the explanations that people bring to them". Ma [31] has stated that "Quantitative research use data that can be represented in the form of numbers or that can be immediately transported into numbers. In qualitative research, data then are represented as words and pictures, rather than numbers". Wohlin et al [29] have argued that "Qualitative research begins with accepting that there is a range of different ways of interpretation. It is concerned with discovering the causes noticed by the subjects in the study, and understanding their view of the problem at hand".

3.2.1.1 Questions: We have formulated various questions as given in our developed questionnaire. We have used seven point likert scale (Extremely satisfied, moderately satisfied, slightly satisfied, neither, slightly dissatisfied, moderately dissatisfied and extremely dissatisfied) for a purpose to take detailed feedback on the identified practices of SLR for the critical challenges.

The questionnaire is divided into four sections: Demographic data are provided in Section 1, challenges of outsourcing contract management are placed in Section 2, in Section 3 practices for each are challenges are reported and instruction of questionnaire submission are given in Section 4.

In order to preserve the privacy of the data and participants, a report of the ethical principles that the research team would obey was delivered to the participants. It was also ensured to the participant that the provided data would not be disclosed to anyone apart from the research team. Furthermore, it was ensured to the participants that the research team would not distribute/share the confidential data with anyone in a way that could disclose any participant's identity or organisation.

3.2.1.2 Questionnaire piloting: The questionnaire was piloted first before its distribution to the target population. It was piloted through 10 members of software engineering research group (SERG-UOM) at University of Malakand. We received some minor suggestions for improvements that were incorporated before its delivery to the target population.

3.2.1.3 Participants' selection: An invitation letter (consent letter) along with the short description of the research was posted on the following links for the distribution of the questionnaire survey.

a. LinkedIn Group (http://www.linkedin.com)

b. Groups on social media (e.g., www.facebook.com)

c. Software companies at Pakistan

d. We also invited for participations the authors of the industry papers selected through the SLR; emails were available in the published papers.

e. We also sent hard copies of the questionnaire to some experts at software industry in Pakistan upon receiving their consents.

3.2.2 Questionnaire Procedure

Questionnaires were carried out between December 2014 and January 2015. Prior to Questionnaire, each participant was sent questionnaire invitation letter. This letter outlined the main themes to be covered during the questionnaire, the expected duration, and measures which would be taken to ensure privacy and confidentiality.

All questionnaires were conducted through online, using the Google Docs free online tool.

3.2.3 Data Analysis Strategy

We received consents for participation in the survey from 103 software outsourcing experts in total, and we sent/shared the questionnaire with all these experts either in soft form or printed form in some cases. We received the responses from 94 experts only. Due to our pre-defined quality criteria, 06 responses were excluded. Thus the final sample of the completed questionnaires received was dropped down to 88 in total. Thus we received the response rate of 85%. Amongst these 65 were responses received from national/local experts in the industry and 29 responses received from foreign experts belonging to 15 different countries.

4. RESULTS AND DISCUSSION

In this section, we have discussed our findings of the SLR for identification of practices for mitigation/avoidance of the critical challenges faced by vendors in OSDO contract. The critical challenges, 09 in total, along with their relevant identifies practices are given in the subsequent sections.

4.1 Lack of Project Management

Project management can play an important role between the stockholders involved in OSDO contract. Buchta et al [32] have "defined various causes of poor project management such as weak relationship of client with outsourcing vendor organisation, cultural and linguistic issues. Remus et al [33] have discussed different standards of project management rating, e.g. high and low level design, risk analysis and testing". We have identified 17 practices as shown in Table 3 for mitigation/avoidance of the critical challenge 'lack of project management'.

4.2 Poor Monitoring System

It is argued that "weak contracting based on inadequate assessment of a vendor bid and backed up by poor monitoring systems, not only results in unanticipated, higher costs; it can create major problems for clients, too" [34]. The drafting of contract is important while monitoring of the work is even more important [33]. We have identified 07 practices as shown in Table 4 for mitigation/avoidance of the critical challenge 'poor monitoring system'.

4.3 Lack of Outsourcing Relationship Management

In outsourcing "software development a good relationship between the outsourcing parties can assist in outsourcing contract management. Herbsleb et al [35] have defined some of the problems in outsourcing relationships such as distance, poor documentation, culture differences and network problems. A poor relationship management between both the outsourcing parties can imply negative impact on the outsourcing contract management" [36]. We have identified 07 practices as shown in Table 5 for mitigation/avoidance of the critical challenge 'lack of outsourcing relationship management'.

Table 3. List practices for addressing lack of project management.

*CC # 1: Lack of project management			
Practice No.	**Practice**	**% of SLR (n=84)**	**% of Q. Survey (n=88)**
**CCP-1.1	"Establish proper definition of project size, milestones and deliverables"	14	48
CCP-1.2	"Prior definition of draft that include project plan and project process".	14	31
CCP-1.3	"Proper coordination between client and vendor from start of the project and effective previous relationship between both the parties enhance the success of project management".	14	41
CCP-1.4	"Ensure technical ability and to train of project management team for outsourcing contract"	4	28
CCP-1.5	"Avoiding of the hidden cost and use of a cost estimation and cost mitigation models such as (COCOMO, COSYSMO, Function Point Analysis, Parametric Estimating, PRICE Systems etc.) to reduce the cost of software development that will lead toward better project management"	4	32
CCP-1.6	"Team leader motivation can reduce issues in project management"	4	33
CCP-1.7	"Establish internal audit, external audit mechanisms and use of proper control mechanism model such as (State-Transition Model of Trust Management, Role-based Access Control, etc.) for an effective project management"	10	25
CCP-1.8	"Negotiate with client over various issues, use of open communication and improvement of ongoing skills to reduce the communication gap".	5	36
CCP-1.9	"Establish detailed written agreement, proper documentation, work product and management of related record between both the parties involved"	5	34
CCP-1.10	"Proper transferring of knowledge/information between onsite and offshore teams involve in offshore outsourcing software development projects".	5	33
CCP-1.11	"Check your project management readiness for the global activity".	6	30
CCP-1.12	"Establish trust building activities between the outsourcing parties reduce chance of lack of project management"	5	27
CCP-1.13	"Implement proper scheduling that guarantee directly toward efficient project management"	2	33
CCP-1.14	"Efficient understanding of the client's language and culture"	4	23
CCP-1.15	"The record of pilot project and good track record direct project toward success"	4	31
CCP-1.16	"Proper infrastructure, definition of rules and regulations of vendor organization"	2	28
CCP-1.17	"Define intellectual property and copyright protection"	2	33

** CC stands for Critical Challenge, **CCP stands for Critical Challenges' Practice.*

Table 4. List of practices for addressing poor monitoring system.

*CC # 2: Poor monitoring system			
Practice No.	**Practice**	**% of SLR (n=84)**	**% of Q. Survey (n=88)**
**CCP-2.1	"An effective control/governance on various project activities such as proper identification , estimation, evaluation and management planning, controlling and monitoring"	8	33
CCP-2.2	"Proper record keeping, efficient documentation, negotiation"	14	35
CCP-2.3	"Define proper monitoring system"	14	31
CCP-2.4	"Performance monitoring can be performed through a peer review process, involvement of experts and third party and use of latest technology"	15	20
CCP-2.5	"Monitoring the performance against objective criteria to achieve the goal"	1	36
CCP-2.6	"Proper schedule obeying reduce monitoring risk"	6	33
CCP-2.7	"Define process for system monitoring"	5	34

** CC stands for Critical Challenge, **CCP stands for Critical Challenges' Practice.*

Table 5. List of practices for addressing lack of outsourcing relationship management.

*CC # 3: Lack of outsourcing Relationship management			
Practice No.	**Practice**	**% of SLR (n=84)**	**% of Q. Survey (n=88)**
**CCP-3.1	"Proper negotiation/ documentation between outsourcing parties"	2	52
CCP-3.2	"Setting/ obeying of terms and conditions by both the outsourcing parties involved"	15	35
CCP-3.3	"Culture understanding by both the outsourcing parties"	1	28
CCP-3.4	"Risk understanding and find immediate solutions"	1	31
CCP-3.5	"Follow tight timing schedule and in-time decision support system by both the outsourcing parties involved"	7	20
CCP-3.6	"Knowledge/ information sharing can improve outsourcing management activities"	4	27
CCP-3.7	"Trust building activities in outsourcing parties can reduce outsourcing risks"	1	30

** CC stands for Critical Challenge, **CCP stands for Critical Challenges' Practice.*

Table 6. List of practices for addressing culture and linguistic issues.

*CC # 4: Cultural and linguistic issues			
Practice No.	**Practice**	**% of SLR (n=84)**	**% of Q. Survey (n=88)**
**CCP-4.1	"The training and interaction of staff on both sides about culture to ensure the quality of what is ultimately supplied and resolve culture issues"	6	39
CCP-4.2	"Knowledge sharing activities avoid a dispute of culture conflict"	6	27
CCP-4.3	"Define awareness about culture to reduce the gap"	17	31
CCP-4.4	"To avoid misunderstanding define negotiation policy"	17	36
CCP-4.5	"Arrangement of face to face meetings between the outsourcing parties involved"	17	30
CCP-4.6	"Define communication channels between stakeholders"	17	24
CCP-4.7	"Define hotline between client and supplier"	18	35
CCP-4.8	"Common methodologies and tools should be used to unite the efforts of different teams working on the project that have different languages and cultures"	2	33

** CC stands for Critical Challenge, **CCP stands for Critical Challenges' Practice.*

4.4 Culture and Linguistic Issues

Culture and linguistic issues can weaken the outsourcing contract between stakeholders involved in OSDO contract. Culture differences can create hurdles in requirement specification and ongoing contract management. Krishna et al [37] have conducted two case studies where it has been found that cultural gap can be covered through culture understanding, training and hiring of skilled employees. This challenge can be handled through cultural knowledge, training and" scheduled/face to face meeting. We have identified 08 practices as shown in Table 6 for mitigation/avoidance of the critical challenge 'cultural and linguistic issues'.

4.5 Non-Competitive Price

The main advantage of offshore software development is low-cost and quality software development. A Non-competitive price can affect outsourcing contract management. It has been found that non-competitive price creates problems for client while the vendor organisation can enjoy considerable advantages from it [38]. Jiang et al [39] stated that vendor organization's main focus is to get the "lowest bidding price, the highest operating cost, and the shortest contract duration". We have identified 13 practices as shown in Table 7 for mitigation/avoidance of the critical challenge 'non-competitive price'.

4.6 IPR and Regulatory Issues

Lack of awareness about intellectual property rights, code of conduct and lack of governance can weak the concept of outsourcing contract management between both the outsourcing parties. Lee and Raisinghani et al [34, 40] have defined various issues of outsourcing contract, e.g., intellectual property matters, information security, staffing, etc. We have identified 09 practices as shown in Table 8 for mitigation/avoidance of the critical challenge 'IPR and regulatory issues'.

Table 7. List of practices for addressing Non-competitive price.

*CC # 5: Non-competitive price			
Practice No.	**Practice**	**% of SLR (n=84)**	**% of Q. Survey (n=88)**
**CCP-5.1	ost reduction through proper negotiation and monitoring between outsourcing parties"	11	34
CCP-5.2	operly define Production costs and transaction costs"	11	31
CCP-5.3	involvement of third party to set the contract for its effective and timely npleteness"	11	23
CCP-5.4	efine clear accountability mechanism"	8	26
CCP-5.5	oper definition for fixed and variable cost setting"	8	24
CCP-5.6	efine suitable pricing policies to enhance outsourcing business"	8	38
CCP-5.7	e of latest technology / tools for proper cost estimation"	6	23
CCP-5.8	nsultancy with domain expert reduce the cost issues"	5	33
CCP-5.9	oper definition of rules and policies to handle non-competitive bidding issues"	2	26
CCP-5.10	oid hidden cost/ extra fees for services beyond the contract"	13	27
CCP-5.11	e of Pareto optimum (win-win) concept to reduce risk and maximize the benefit"	4	30
CCP-5.12	oper caring of schedule timing reduce extra charges and maximize the benefits"	14	34
CCP-5.13	well defined contract management reduce outsourcing cost"	1	38

** CC stands for Critical Challenge, **CCP stands for Critical Challenges' Practice.*

Table 8. List of practices for addressing IPR and regulatory issues.

*CC # 6: IPR and regulatory issues			
Practice No.	**Practice**	**% of SLR (n=84)**	**% of Q. Survey (n=88)**
**CCP-6.1	"Develop indicators to measure Intellectual property (IP) assets"	11	35
CCP-6.2	"Use experienced advisors"	11	39
CCP-6.3	"Decide on a policy for copyright (who is allowed to use protected material and under which circumstances?)"	11	35
CCP-6.4	"Proper role definition for all employees"	11	19
CCP-6.5	"Define code of conduct for both stakeholders"	11	28
CCP-6.6	"Establish and communicate clear security guideline to protect business secret, data protection, IPR and exit management"	5	22
CCP-6.7	"Develop awareness of the role of IP in outsourcing parties"	5	25
CCP-6.8	"Clear process management mechanism can effectively improve IPR, visibility and quality"	21	33
CCP-6.9	"Formulate policies for handling invention/design made by employees"	5	28

** CC stands for Critical Challenge, **CCP stands for Critical Challenges' Practice.*

4.7 Failure to Manage End-User Expectation

This kind of challenge arises due to improper communication, insufficient requirements and lack of employees' training. This may cause to initiate the problem when the end-user is not satisfied from the generated outcome of the project. Vagadia [41] stated that proper contract between the outsourcing parties can fulfill their desired expectations. Nakatsu et al [42] have defined that "expectations must be managed to ensure that the project deliverables will be consistent with the perceptions of the users". We have identified 09 practices as shown in Table 9 for mitigation/avoidance of the critical challenge 'failure to manage end-user expectation'.

4.8 Lack of Negotiation Strategies

"Lack of negotiation issue may arise due to lack of information sharing, improper channels that are using for communication and lack of cooperation between both the outsourcing parties. Tuten and Urban [43] have defined that improper communication between the client, and vendor organisations frail their outsourcing contract and finally leads toward failure of the whole" project. We have identified 09 practices as shown in Table 10 for mitigation/avoidance of the critical challenge 'lack of negotiation strategies'.

Table 9. List of practices for addressing Failure to manage end-user expectation.

*CC # 7: Failure to manage end-user expectation			
Practice No.	**Practice**	**% of SLR (n=84)**	**% of Q. Survey (n=88)**
**CCP-7.1	"Understanding the exact requirements or risk avoidances can satisfy customer"	6	45
CCP-7.2	"Define policy to get all client requirements"	6	32
CCP-7.3	"Proper communication and pilot project record cover the gap of customer satisfaction"	10	31
CCP-7.4	"Arrange frequent visits to carry on contract management"	10	38
CCP-7.5	"Define customer service phone bank, hotline complaint phone to avoid the arising risks"	10	20
CCP-7.6	"Establish control mechanism and the ability to fulfill client requirements"	6	23
CCP-7.7	"Proper definition of quality management procedures for quality software production"	4	33
CCP-7.8	"Dividing the software development into parts to speed up can get user expectation"	11	36
CCP-7.9	"Defining and obeying of rules and regulation for service, time and budget move a project on right track"	6	39

** CC stands for Critical Challenge, **CCP stands for Critical Challenges' Practice.*

Table 10. List of practices for addressing Lack of negotiation strategies.

*CC # 8: Lack of negotiation strategies			
Practice No.	**Practice**	**% of SLR (n=84)**	**% of Q. Survey (n=88)**
**CCP-8.1	"Establish both formal (open interview, survey, and meeting) and informal modes of communication e.g. (rich media like social media, etc.)"	25	31
CCP-8.2	"Use code of conduct for safe and sound communication"	1	34
CCP-8.3	"Provide training to team members about proper negotiation"	5	38
CCP-8.4	"Facilitation of renegotiation satisfy both outsourcing parties"	6	24
CCP-8.5	"Establish regular meeting calendar for outsourcing parties"	6	17
CCP-8.6	"The team members motivation and knowledge sharing can improve negotiation"	5	22
CCP-8.7	"Documentation of the meeting can assist the outsourcing parties"	2	34
CCP-8.8	"Arrangement of audio/ video chat to save the time and cost of project and improve communication between both the parties."	8	35
CCP-8.9	"Project goal specification lead toward positive negotiation"	8	28

** CC stands for Critical Challenge, **CCP stands for Critical Challenges' Practice.*

4.9 Failure to Manage End-User Expectation

This "kind of challenge arises due to improper communication, insufficient requirements and lack of employees' training. This may cause to initiate the problem when the end-user not satisfied from the generated outcome of the project. Vagadia [41] stated that proper contract between the outsourcing parties can fulfill their desired expectations". Nakatsu et al [42] have defined that "expectations must be managed to ensure that the project deliverables will be consistent with the perceptions of the users". We have identified 09 practices as shown in Table 9 for mitigation/avoidance of the critical challenge 'failure to manage end-user expectation'.

4.10 Lack of Negotiation Strategies

"Lack of negotiation issue may arise due to lack of information sharing, improper channels that are using for communication and lack of cooperation between both the outsourcing parties. Tuten and Urban [43] have defined that improper communication between the client, and vendor organisations frail their outsourcing contract and finally leads toward failure of the whole" project. We have identified 09 practices as shown in Table 10 for mitigation/avoidance of the critical challenge 'lack of negotiation strategies'.

Table 11. List of practices for addressing unforeseen contingencies.

***CC # 9: Unforeseen contingencies**			
Practice No.	**Practice**	**% of SLR (n=84)**	**% of Q. Survey (n=88)**
**CCP-9.1	"Establish internal audit and external audit mechanisms"	33	42
CCP-9.2	"Proper arrangement of training for emergency situation"	21	35
CCP-9.3	"Knowledge sharing and educate staff members about project activities/objective and client culture"	12	35
CCP-9.4	"Organisation should develop policies, standards, milestones and review these on periodic basis"	8	32
CCP-9.5	"Recruitment of well qualified and professional staff members reduce future risks"	7	34
CCP-9.6	"Defined staff flexibility, switching of staff between sites and vendor capability reduce chance of unforeseen contingencies."	4	17
CCP-9.7	"Improve the performance and trust building to avoid failure incident which, arise due to requirement specification"	11	33
CCP-9.8	"Proper control on cost consumption and define procedure for audit policy and audit process"	5	20
CCP-9.9	"Proper planning for risk reduction and define their proper solution"	5	35
CCP-9.10	"To avoid hidden cost and information between the outsourcing parties"	2	27
CCP-9.11	"Create team of think tanks to provide solutions for any emerging situation"	6	27
CCP-9.12	"Proper coordination between outsourcing parties reduce the unforeseen risks"	13	41

** CC stands for Critical Challenge, **CCP stands for Critical Challenges' Practice.*

Table 12. List of best practices of critical challenges in OSDO contract.

***CC # 1: Lack of project management**			
Practice No.	**Best Practice**	**%age of SLR (n=84)**	**ES % of Q. Survey (n=88)**
**CCP-1.1	"Establish proper definition of project size, milestones and deliverables"	14	48
CCP-1.2	"Prior definition of draft that include project plan and project process"	14	31
CCP-1.3	"Proper coordination between client and vendor from start of the project and effective previous relationship between both the parties enhance the success of project management".	14	41
CCP-1.4	"Establish internal audit, external audit mechanisms and use of proper control mechanism model such as (State-Transition Model of Trust Management, Role-based Access Control, etc.) for an effective project management"	10	25
CC # 2: Poor monitoring system			
CCP-2.1	"Proper record keeping, efficient documentation, negotiation"	14	35
CCP-2.2	"Define proper monitoring system"	14	31
CCP-2.3	"Performance monitoring can be performed through a peer review process, involvement of experts and third party and use of latest technology".	15	20
CC # 3: Lack of outsourcing relationship management			
CCP-3.1	"Setting/ obeying of terms and conditions by both the outsourcing parties involved"	15	35
CC # 4: Cultural and linguistic issues			
CCP-4.1	"Define communication channels between stakeholders"	17	31
CCP-4.2	"To avoid misunderstanding define negotiation policy"	17	36
CCP-4.3	"Arrangement of face to face meetings between the outsourcing parties involved"	17	30
CCP-4.4	"Define hotline between client and supplier"	17	24
CCP-4.5	"A continuous linkage between client and supplier with a shared, mutual understanding and the goals is likely to be the most successful source to cover culture gap".	18	35

*CC # 1: Lack of project management			
Practice No.	**Best Practice**	**%age of SLR (n=84)**	**ES % of Q. Survey (n=88)**
CC # 5: Non-competitive price			
CCP-5.1	"Cost reduction through proper negotiation and monitoring between outsourcing parties"	11	34
CCP-5.2	"Properly define production costs and transaction costs"	11	31
CCP-5.3	"An involvement of third party to set the contract for its effective and timely completeness"	11	23
CCP-5.4	"Avoid hidden cost/extra fees for services beyond the contract"	13	27
CCP-5.5	"Proper caring of schedule timing reduce extra charges and maximize the benefits"	14	34
CC # 6: IPR and regulatory issues			
CCP-6.1	"Develop indicators to measure intellectual property (IP) assets"	11	35
CCP-6.2	"Use experienced advisors"	11	39
CCP-6.3	"Decide on a policy for copyright (who is allowed to use protected material and under which circumstances?)"	11	35
CCP-6.4	"Proper role definition for all employees"	11	19
CCP-6.5	"Define code of conduct for both stakeholders"	11	28
CCP-6.6	"Clear process management mechanism can effectively improve IPR, visibility and quality"	21	33
CC # 7: Failure to manage end-user expectation			
CCP-7.1	"Proper communication and pilot project record cover the gap of customer satisfaction"	10	31
CCP-7.2	"Arrange frequent visits to carry on contract management"	10	38
CCP-7.3	"Define customer service phone bank, hotline complaint phone to avoid the arising risks".	10	20
CCP-7.4	"Dividing the software development into parts to speed up can get user expectation"	11	36
CC # 8: Lack of negotiation strategies			
CCP-8.1	"Establish both formal (open interview, survey, and meeting) and informal modes of communication e.g. (rich media like social media, etc.)"	25	31
CC # 9: Unforeseen contingencies			
CCP-9.1	"Establish internal audit and external audit mechanisms"	33	42
CCP-9.2	"Proper arrangement of training for emergency situation"	21	35
CCP-9.3	"Knowledge sharing and educate staff members about project activities/objective and client culture"	12	35
CCP-9.4	"Improve the performance and trust building to avoid failure incident which, arise due to requirement specification"	11	33
CCP-9.5	"Proper coordination between outsourcing parties reduce the unforeseen risks"	13	41

** CC stands for Critical Challenge, **CCP stands for Critical Challenges' Practice.*

4.11 Unforeseen Contingencies

"A good and durable outsourcing contract can be managed between the client and vendor organisations through detailed policy and contingency plan definition. Stefan [44] has defined that uncertainty; unforeseen contingencies and contradictory information are major issues faced by the vendor organisations in proper contract" management. We have identified 12 practices as shown in Table 11 for mitigation/avoidance of the critical challenge 'unforeseen contingencies'.

5. LIMITATIONS

We have used two different methods for identification of the practices. First we conducted SLR to review the literature in a systematic way. We have followed all the steps of the SLR process. However due to large number of papers and search

engines retrieval mechanisms, we may have missed some of the relevant papers. However this is not a systematic omission.

Secondly, we conducted questionnaire survey in OSDO industry using online and offline tools in order to validate findings of the SLR and to find out any new practice(s) apart from the identified ones. We followed all the standard guidelines, during the design, piloting, distribution to the target population and analysis of the finally selected completed questionnaires. However due to space limitations we are unable to attach the full questionnaire in the paper.

Our survey received responses from a total of 88 OSDO experts. This sample include 29 foreign and 59 local experts in Pakistan For generalization, it would be better if we should have involved more foreign/international participants instead of the local ones but it was not possible due to limited resources and time at this stage. We have utilized every possible source to approach foreigner experts through different social and professional network groups available on internet; even we have emailed them personally to participate in our questionnaire survey. However their participation was purely on voluntary basis. Due to limited number of respondents from foreign, one should be careful while generalizing the results. To internal validity one possible threat is that for any specific response, that may have not in fact described underlying reasons to report outsourcing contract challenges. This threat may not have been able for us to control independently. In these responses the participants would not be supposed to give the original reasons of OSDO contract.

We have used questionnaires and one weakness of survey method is that participants are given with a list of possible options as we provided the list of practices, identified through SLR earlier, of the critical challenges. This exercise limits the respondents to those reported practices where the respondents only concentrate on the practices given in the list. To overcome this issue we also motivated the respondents to provide other practices for the critical challenges apart from those mentioned in the questionnaire.

Overall there is no major difference between the findings of the SLR and questionnaire survey which gives strengths to the generalization and validity of our findings.

6. CONCLUSIONS

We have found 17 practices for addressing the challenge ‘lack of project management’, 07 practices for addressing ‘poor monitoring system’, 07 practices for ‘lack of outsourcing relationship management’, 08 practices for ‘cultural and linguistic issues ', 13 practices for ‘non-competitive price’, 09 practices for ‘IPR and regulatory issues ', 09 practices for ‘failure to manage end-user expectation’, 09 practices for ‘lack of negotiation strategies’ and 12 practices for ‘unforeseen contingencies’. We have categorized these practices into low-rating and high-rating (best practices) on the basis of its occurrences. We will consider those practices as best practices whose occurrence is greater than or equal to 10% in both SLR and empirical study. We have found 34 best practices using this criterion. Based on this criterion the best practices for each of the critical challenge are given in the Table 12.

We have collected all these practices through the predefined procedure of SLR [45]. In total 91, identified practices can assist vendor organisation to avoid/mitigate the challenges for managing the outsourcing contract.

The identified challenges can influence the performance of outsourcing contract management of both the parties. To avoid or mitigate the effect of these challenges the identified practices can assist the outsourcing vendor organisation in this context. The proper implementation of these practices can improve efficiency of outsourcing vendor through avoidance/mitigation of the critical challenges.

The ultimate goal of this research is to develop software outsourcing contract management model from vendor’s perspective that will assist vendor organisations in managing a good contract with client organisations during the whole period of contract. This paper contributes to the 2nd phase of our proposed model.

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