An Empirical Investigation of Critical Challenges in Outsourcing Projects: A Survey Based Study

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Abstract: From the recent past decades, most firms across the globe have started assuming the Global Software Engineering so as to lessen the software development cost, access to competitive global market and advance technological skills and resources. Due to the abrupt improvement of Information and Communication Technologies the global software engineering has become an alluring commercial approach with numerous paradigms. Offshore Software Development Outsourcing is one of the flourishing outsourcing paradigm of the Global Software Engineering. However, this era is confronting numerous challenges which hinder the success of outsourcing projects. In this study an empirical research has been carried out by employing an online questionnaire survey based on industrial expert opinions by validating the critical challenges concerning to the software outsourcing projects. The questionnaire has been processed with a total of 28 participants across the globe in which five responders were foreigner and the remaining were from our local country Pakistan. By analysing the result statistics from the questionnaire report we found that our findings showed 90 percent resemblance from the industrial perspective too. By considering the validated results will help all the software outsourcing stakeholders to proceed their project with positive influence and maximum percentage of success.

Keywords: Offshore software development, Software development outsourcing, outsourcing challenges, offshore software outsourcing.

I. INTRODUCTION

Offshore Software Development Outsourcing is a new paradigm for global investors which paved the way for advanced business strategies in the purview of Global Software Engineering (GSE) for the production and development of high quality software product at low price in low waging countries. Software outsourcing is basically a bilateral and mutual agreement among the software business stakeholders though which the client side party contract out all or some parts of its software project to the vendor software stakeholder's who furnish the consented work in the shape of remuneration [1][2]. GOO et al. [3] reported that maximum number of academic and industrial research scholars in the field of global software engineering are concentrating on the exercises and techniques related to software outsourcing namely contract fall out, negotiation, partnership development, and sharing of knowledge. These procedure and techniques complement great worth and play important role in the development and the flourishing of global software outsourcing initiatives. Furthermore, appropriate censoring and assessment plans confirms the success of the project in the outsourcing phenomena. In depth and comprehensive outsourcing contract plays a major role in the well and smooth processing of the project [4]. Offshore software outsourcing has tremendous positive impact on the business strategies and paved a stair toward a rapid increase after 2001 and constantly flourishing across the globe for economic growth [5]. Associated reasons for the software offshoring is that the client organization take advantage from offshore vendors in developed countries as they cost one-third less than their onshore vendor's and even less than in-house exercise [6]. The most dominant countries nowadays in software outsourcing are India and China in Asia [7]. Besides these the offshore vendor's try to advance their services by employing state-of-the-art technologies, skilled software engineers and adequate setup to fulfil their client requirements [6][8]. Even though a number of advantages can be taken from software outsourcing yet it associated with tough critical challenges and risks. Maximum number of the outsourcing projects did not proceed towards success due to inadequate selection of contractor, disregard of contract importance, poor quality measures and poor knowledge sharing and requirement analysis strategies [5], [6]. One of the highest ranked challenges is controlling the complex coordination and communication problems because of time management and cultural detachment [9][10][11]. Additional challenges involves outsourcing practices, poor contract management, and lack of trust [12][13]. Though, the significance of offshore software outsourcing slight empirical research has been conducted on this phenomena in general and the detection of significant elements which play a vital role in succeeding software outsourcing project in particular. On the basis of the importance of the era, we have carried out an empirical investigation using survey methodology to unearth the numerous challenges associated with the offshore software outsourcing projects. The remaining paper is structured as follows: Section 2 throws light on the background. Section 3 outlines the research methodology. Section 4 explains the discussion on findings. Section 5 shows limitations. Section 6 provides conclusion and future work.

II. RELATED WORK

In the contemporary period software development corporations focuses on the outsourcing of software projects from the various developed countries to underdeveloped and backward countries due to lessen cost and high quality software products [13]. This outsourcing growth from to country in perceptible due to the rapid advancement in the global and local market which increase the market competition everywhere, globally. Per year, a large amount of competitors take part in this global race and benefit themselves according to their project scope and investment from the highly professional staff and state-of-the-art technological resources. Still outsourcing in the context of software engineering is opposing various challenges concerning software outsourcing projects which are confronted by the stakeholder. A systematic research study was conducted to probe the underlying challenges in the software outsourcing domain with main focus on the client and vendor partnership building and associated relationships. The study was based on the challenges in which India was categorized as vendor and Unites State as client [14]. Another industrial researcher Sakthival [15] examined various problems relating to software outsourcing contract and enhancement. Khan et al. [16] formulated a research study by employing SLR methodology to find out different challenges in outsourcing software projects.

In [17] the researcher presented and reported their work on the documentation of numerous causes for the software project failure in the outsourcing initiatives before and after the execution of the project from the client perspective. utmost, research findings in the global software engineering are concerning to the organization policies focusing on the general IT issues such as data centre activities, software operations, software maintenance, and process improvement activities [17][18].

Earlier research findings unearth various issues which throw lights on the software process improvement, partnership relationship building, appropriate software project planning and requirements analysis where these issue were probed and analysed through focus group, programmer self-opinions, and case-studies. The analysed reports shows that there is still a big gap in the global software engineering field [19][20][21]. The tremendous growth and the flourishing environment of the global software engineering provides an impulsive opportunities to clients to outsource their software work and software engineering activities to near-shore and offshore countries for the development. However, the proper monitoring, control, and management of the outsourcing project is difficult when it comes to comparison with the in-house and local development operations [14][22]. In [15], the researcher investigated the management and bilateral relationship building among the outsourcing stakeholders and identified that three main factors are necessary for outsourcing software projects i.e. coordination and communication, time-zone differences management, and the project planning in the initial phase.

The mainstay of the outsourcing software is the underlying proper and robust management of the contract planning and negotiation which ensure the success up to greater extent [3]. In [16], the researchers have worked on the research study with the focus on the critical challenges in the outsourcing planning which obstruct and hinders the way of the successful execution of the outsourcing software projects. According to them, software outsourcing is a mutual and bilateral consensus among the outsourcing stakeholders through which the one side party swap all or parts of its software activities to another party whose provide agreed services in the shape of remuneration. Their analysed report shows that properly managed agreement lessen the growth of the software outsourcing challenges.

Various researchers with diverse industrial and academic background have examined and conducted their research study with main concentration on software contract out disparity, high level of opportunism, process development and improvement, legacy and advanced technological skills, bilateral relationship building and arrangement, coordination and language diversity and its impact on the underlying paradigm, and knowledge sharing activities [23][15][24][25]. In [5], the researcher investigated various barriers like low quality deliverance, inappropriate and worst communication, no-value of trust, relationship building before, during and after the project delivery, and lack of software project planning. Verner et al. [19], have conducted a thorough study and report their findings which encompasses barriers and challenges in the selection of vendor before outsourcing the software project. They find out various challenges like Intellectual Property Right (IPR) issue, vendor opportunism, language and cultural issues, communication differences, and country instability. In [26] the researchers investigated the challenges related to software outsourcing projects failure like immature juristic system, non-political support, unstable and worst government, public opposition, lack of commitment, differences in working style, staff turnover, and imbalanced responsibility distribution.

Prior to this paper we have conducted a thorough Systematic Literature Review (SLR) for the identification of various critical challenges in software outsourcing projects and submitted to a journal for review. In order to validate our SLR findings we have conducted an online questionnaire based survey with a total of 28 different experts from various software firms. All the participants were asked questions via a questionnaire to rank the identified Critical Challenges (CC's) on seven point likert scale. This paper covers the validation from the industrial perspective of the identified CC's and reassert our SLR findings.

III.RESEARCH METHODOLOGY

In order to our previous findings and results we have planned to execute a questionnaire by employing the survey methodology. For processing the survey we have used the online free available tool Google Drive for the data collection purpose. Survey is a research methodology which is considered one of the best tool specifically a method of collecting data both qualitatively and quantitatively [27].

Questionnaire based survey method is based on two major steps which are the designing of questionnaire and sampling. We have designed a questionnaire which were based on seven pints likert scale (1. Strongly Agree, 2. Moderately Agree, 3. Slightly Agree, 4. Strongly Disagree, 5. Moderately Disagree, 6. Slightly Disagree, 7. Neutral) against each identified challenges. For the testing purpose of the questionnaire we conducted a pilot testing and distributed the questionnaire among the top 5 scholars which belongs both to industry and academia of the Department of Computer Software Engineering (CSE), University of Engineering and Technology (UET), Mardan. From the pilot testing we conclude that the questionnaire will take around 15 minutes to attempt and rank all the identified challenges of our previous study. In order to distribute the online questionnaire we wrote a letter of invitation with some providing a brief background of research study plan and were mailed to LinkedIn, Facebook, and software organizations at Pakistan. In the response, we got a total of 71 industrial experts which showed their willingness for participation in our study plan and web links was shared with these industrial experts. In the proposed predefined time frame, we received a total of 39 filled questionnaire which were assessed by applying the defined quality criteria which results a total of 28 responses. Among these responses 5 participants were foreigner while the remaining participant belongs to Pakistan.

IV.SURVEY BASED RESULTS

In the distributed questionnaire various participants have choose different option and rake the value to the identified challenges. For the assessment and evaluation purpose we have made three different categories from the design questionnaire on the basis of the questions as shown in Table 1. The responses were categories as: 1. Positive (Strongly agree, moderately agree, and slightly agree), 2. Negative (Strongly disagree, moderately disagree, and slightly disagree), 3. Neutral (not sure).

Table I
Validation Responses of the Questionnaire Survey

| Sr. No | Challenges | Total Expert Responses = 28 | | | | | | | | | |
| | | Positive | | | | Negative | | | | Neutral | |
		Strongly Agree	Moderately Agree	Slightly Agree	% of Agree	Strongly Disagree	Moderately Disagree	Slightly Disagree	% of Disagree	Not Sure	% of Not Sure
1	Poor coordination and communication	12	8	7	96	0	0	1	4	0	0
2	Poor outsourcing relationship	9	8	6	82	1	2	2	18	0	0
3	Opportunistic behaviour	8	9	6	82	1	2	1	14	1	4
4	Language and cultural differences	9	6	6	75	2	2	2	21	1	4
5	Lack of contract negotiation	8	4	8	71	0	2	5	25	1	4
6	Poor project management	11	7	4	79	1	1	2	14	2	7
7	Poor monitoring and control	10	5	6	75	1	3	2	21	1	4
8	IPR Issues	7	6	5	64	1	4	4	32	1	4
9	Lack of technical capabilities	8	6	7	75	1	2	3	21	1	4
10	Geopolitical and country instability	7	6	7	71	1	2	3	21	2	7
11	Poor requirement specification	5	8	5	64	0	4	5	32	1	4
12	Difference in development methodologies	5	6	5	57	2	4	3	32	2	7
13	Failure to manage end user expectations	7	5	9	75	0	3	2	18	2	7
14	Vendor employee high turnover	6	6	10	79	2	0	1	11	3	11
15	Constraints due to time zone	6	7	6	68	0	2	4	21	3	11
16	Poor Mgt. of budget, schedule & delay	8	5	9	79	1	2	1	14	2	7
17	Lack of quality	4	7	9	71	2	1	4	25	1	4
18	Inadequate user involvement	6	5	8	68	2	1	4	25	2	7
19	Non-competitive price	3	6	9	64	5	2	1	29	2	7

V. RESULTS DISCUSSION

A. Positive Ranked Challenges By Responders

From Table 1, conclude that all the identified challenges were ranked by the participants in a positive manner. By positive manner we mean that all the challenges were rank above 60% which shows these factors play an important role for the software outsourcing projects from the industrial perspective too.

The high ranked challenge with agreed positive percentage is 96% which is 'Poor Coordination and Communication'. coordination and communication may comprise the interaction space between the outsourcing vendor's and clients, low level of communication and collaboration infrastructure, deficiency of proper training needed for better collaboration and communication tools and technology, inadequate client involvement and ignorance of face-to-face sessions and synchronous communication [28]. In several situations the organization efficiency towards the success of the project gradually cut to half of the working efforts due to the hindrance factors such as important communication and coordination at every level of the outsourcing project [29].

82% of the agreed positive response from the various participants were both 'poor outsourcing relationship building' and 'opportunistic behaviour'.

Outsourcing relationship effects the joint-effort and teamwork of outsourcing vendor's and client. This may lead to less interest and pursuit, falling-off of services, lack of expected quality, and no consensus on project deadline and budget overrun [30]. Chittenden [31] explained that 'provision of poor resourcing while signing the outsourcing contract is a usual reason of contract failure: non-professional staff or staff with inappropriate experience is also the key concern'.

Opportunism lies in two facets in offshoring, misappropriation of information assets (MIA) and lessening [32]. According to Hoect and Trott [33] "an agent will be called trustworthy when his or her partner exposes himself/herself to the threat of opportunism while his/her partner will exploit this occasion". Opportunism is directly connected with gaining trust which leads to lack of reliability, lack of honesty and integrity [28].

79% responses were rand by different industrial expert for the 'poor project management' factor. In offshore outsourcing software project management performs a fundamental role as it is very tedious and complex job to manage the offshore team and tasks: Linda et al. [34] have reported the risks associated with inefficient software project planning. Niazi et al. [35] have recognized different challenges concerning lack of project management such as 'knowledge management', 'time zone', 'lack of coordination' and 'lack of communication'.

'Language and cultural difference' challenges was also found the important factor for the success of offshore software development outsourcing project with positive responses of about 75% from the industrial perspective. From the last two decades North American countries and United Kingdom have outsource their projects to offshore countries such as China, Russia, India, Malaysia and Pakistan where their native language was not English [36] due to which 80% of their projects were not succeeded. Another issue was the difference of culture because their culture don't have any match. Many researchers have worked on the cultural and language variations on outsourcing:

1) In a research report [36] the researcher focused on some political and cultural problems in the offshore software globalization.
2) In another study [37] a study report was conducted in the United Kingdom and Asian country India about the various problems of UK and India. They have highlighted the act of control and power cut during outsourcing process.

71% of agreed responses were gathered from the questionnaire about the challenges 'lack of contract negotiation'. Poorly planned contract decrease the operation of organization which has direct association to the understanding of proper requirements at every stage [37]. Iacovou and Nakatsu [38], have explained that "top management support is essential in securing the needed resources and cooperation across organizational groups and for enhancing the legitimacy of the project". Iacovou and Nakatsu [38] also reported that "expectations must be managed to ensure that the project deliverables will be consistent with the perception of the user".

Similarly 'lack of technical capabilities' were selected by various responder with cumulative percentage of 75%. Lack of technical capabilities encompass uncompetitive updated professional skills, task complication, difficulty in the comprehension of client side demanded technology, lack of advance and state-of-the-art research capability and lack of disinclination to new technology.

Similarly other challenges with highest percentage above 60% with positive ranking are poor requirements specifications (64%), differences in development methodologies (57%), failure to manage user expectations (75%), vendor employee high turnover (79%) etc. as shown in Table 1.

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B. Negative Ranked Challenges by Responders

From the responses of the various responders we get varied results in the negative category. The highest ranked challenges marked by different responders are poor requirements specifications, differences in the development methodologies, and IPR issue with a percentage of 32%. 29% of the responders marked the non-competitive price. Moreover, lack of contract management, lack of quality, and inadequate user involvement were ranked by 25% of the responders. Similarly language and cultural differences, poor monitoring and control, lack of technical capabilities, geopolitical and country instability, and constraints due to time zone differences were ranked 21% of the responders in the questionnaire.

VI. STUDY LIMITATION

This section throws light on the assessed and ensured validity of our empirical investigation. The only probable lack to our internal validity investigation is the very small level of foreigner participants. In a total of 28 responders only 5 respondents take participation in our planned study. We have tried to increase the foreigner participants for the validation with time to time reminder in our stipulated time but only 5 participants were agreed to response. Besides this, we make our best effort to access and reach to the international industrial experts. After designing the questionnaire we have access many expert via LinkedIn and Facebook and posted the survey questionnaire to them via email. In the response only short foreigner and local participants showed their willingness. Therefore, the article reader must be cautious before generalizing the identified results. Another probable threat to our internal validity is that for the underline responses, the participants did not furnish the reasons for their choosing option about the identified challenges. We were not in the position to control this entire threat independently as we did not provide them any type of such questions for their justification.

VII. STUDY LIMITATION

The main objective of this study was the validation of our previous work in which we have identified numerous challenges in software outsourcing project. For this purpose we have planned to carry out our research study based on an online survey with the help of a questionnaire report. As our study approach was to reach all the global and local industrial that's why, we preferred to conduct this online survey by using the online available tool Google Drive and Google forms. For this we designed a questionnaire with the identified challenges and provide the respondents a seven point likert scale with the option of strongly agree, moderately agree, slightly agree, strongly disagree, moderately disagree, slightly disagree, and neural. By sending invitation to international and local industrial expert a total of 71 responders showed their willingness. Upon sending them the online web form questionnaire, we got a total of 28 filled questionnaire in which 5 were foreigner and the remaining were from our local country Pakistan.

By analyzing the results statistics all the respondents showed their response in the "agreed" category by the ranking the challenges in varied range. Mostly all the identified challenges got above 60% from the industrial experts as shown in Table 1, which shows and testify the fact that our identified results in our previous research work show strong similarity from the industrial perspective too. Furthermore, we conclude from this study that our identified challenges play an important role for the success of the software development outsourcing project. By considering these challenges will help the stakeholders to proceed their outsourcing projects with positive influence and maximum percentage of success.

By considering the importance of the era and the day to day challenges in the outsourcing paradigm, we planned to find the solutions of the investigated challenges in future.

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