

COMMUNICATION AND COORDINATION CHALLENGES IN OFFSHORE SOFTWARE OUTSOURCING RELATIONSHIPS: A SYSTEMATIC LITERATURE REVIEW PROTOCOL

¹Rafiq Ahmad Khan & ¹Siffat Ullah Khan

¹Software Engineering Research Group (SERG_UOM),

Department of Computer Science & IT, University of Malakand, Pakistan.

ABSTRACT

Software outsourcing is fairly a common business practice these days. Outsourcing may just mean to obtain or contract out a work or services offshore. Though Offshore Software development outsourcing (OSDO) has many benefits but it faces several challenges like cultural separation, geographical dispersion, telecommunication requirements, and complex communication and coordination problems in terms of time. Effective and efficient communication and coordination play a vital role in the success of outsourcing projects. The objectives of this research are to find out challenges and critical success factors for communication and coordination in offshore software outsourcing relationships via systematic literature review. For identification of challenges and critical success factors for communication and coordination in OSDO relationships we will use Systematic Literature Review (SLR). The expected outcomes of this review will be a list of challenges and critical success factors for communication and coordination in OSDO relationships. Similarly the outcomes will contain solutions for the identified communication and coordination challenges faced by OSDO vendors. Our ultimate goal is the development of Communication and Coordination Challenges Mitigation Model (CCCMM) for OSDO relationship.

Keywords- Communication and Coordination, OSDO, challenges, Systematic literature review

INTRODUCTION

Software outsourcing is fairly a common business practice these days. Outsourcing may just mean to obtain or contract out a work or services offshore (Engineering, 2012). The main idea behind software development outsourcing is that it is a contract-based relationship between vendor and client organizations in which of one or more vendors can get contracts all or part of clients software development activities, and then vendors provide agreed services in return for payment (Ali-Babar, Verner, & Nguyen, 2007; Kern & Willcocks, 2000; Palvia, 1995).

A. Reasons to perform Software Outsourcing:

To perform software outsourcing there are many reasons. The major reason is the cost reduction for software

outsourcing (Belcourt, 2006; Clark & Zmud, 1997; Lacity & Hirschheim, 1993; Takac, 1994). Some other reasons are: Reduce and control operating cost, improve company focus, gain access to exceptional capabilities, free internal resources for other purposes, resources are not available internally, maximizes restructuring benefits, functions difficult to manage or out of control, make capital funds available and reduce risks (Electronic source, 2000). OSDO can offer various benefits to the onshore organization such as access to local knowledge, proximity to markets, access to qualified and skilled resources at a lower cost, and flexibility in responding to diverse local opportunities (J. Herbsleb & Moitra, 2001).

B. Risks/challenges/barriers in offshore software development outsourcing:

Though OSDO has many benefits but it faces several challenges like cultural separation, geographical dispersion, telecommunication requirements, and complex communication and coordination problems in terms of time (MacGregor, Y.Hsieh, & P.Kruchten, 2005; Milewski et al., 2008). In OSDO, customer and vendor face different challenges like cultural differences, communication and coordination issues, and linguistic problems (Nguyen, Muhammad Ali Babar, & Verner., 2006; A. J. Sargent, 2006). The aim of our study is that to identify the communication and coordination challenges/barriers tackled by clients and vendors in OSDO relationships through Systematic Literature Review (SLR) and to address/solves those challenges in order to meet communication and coordination needs of OSDO. This paper reports our study plan in the form of SLR protocol. The following three questions were formulated in order to understand communication and coordination challenges in OSDO relationships from vendor's perception:

RQ1. What are the communication and coordination challenges/barriers in software outsourcing relationships?

RQ2. What are the solutions/practices, as identified in the literature for addressing communication and coordination challenges in software outsourcing relationships?

RQ3. What are the CSFs and CBs, as identified in the real world practices, for communication and coordination in offshore software outsourcing relationships?

C. Background:

The act of transferring information from one place to another is known as **communication**. Following are some types of communication and any time one may occur. The different types of communication are: Verbal or Spoken Communication: telephone, radio, face-to-face, television or other media. Non-Verbal Communication: gestures, how we dress or act, body language, even our scent. Written Communication: books, letters, magazines e-mails, the Internet or via other media. Visualizations: graphs, charts, maps, logos and other visualizations can communicate messages. The aim of any type of communication is understanding. **Coordination** is the Integration, synchronization and organization of the different fundamentals of an activity or a complex body so as to enable them to work together successfully and (Electronic source) effectively. Coordination is a part/function of management (Electronic source).

From the above definitions we have noted that communication and coordination can affect almost all aspects of our life. Similarly communication and coordination also affect different activities involve in OSDO. Communication plus coordination is one of the crucial problems faced by OSDO organizations. The main rationale behind this problem is the geographical separation of clients and vendors from each other. Therefore, to achieve productivity of OSDO, communication and coordination between client and vendor should be improved. One major reason that OSDO organization does not achieve its goal is the poor communication and coordination between client and vendor (Fabriek. & Matthias, 2007). Communication,

coordination, and collaboration processes are at the heart of, and key enablers of, software development outsourcing (Layman, Williams, Damian, & Bures, 2006). Communication plus coordination are two major pillars of OSDO (Fabriek. & Matthias, 2007). Jimenez et al (2009) stress that the key challenges of GSD are: communication, group awareness, software configuration management, and coordination and collaboration.

In particular, OSDO typically involves stakeholders located in different time zones and geographic locations, from different national and organizational cultures, using different and, at times, unreliable technologies to collaborate. Such geographical, temporal, cultural and linguistic distance can result in significant communication, coordination and control challenges that need to be overcome for the benefits of OSDO to be realized (CD., 2001; Hossain, Bannerman., & Jeffery., 2011; John, Sarah, & Ita, 2010; Lings, Lundell., Bjorn., Agerfalk, & Fitzgerald., 2006; A. Sargent, Jr., 2006; Yalaho & C.Wu.). Difference in time zones limited the ability to communicate in real times (Chang, 2007). Further barriers to communication and coordination are created due to the lack of a common native language (known as “linguistic distance”)(Carmel & Tjia., 2005; J. D. Herbsleb, 2007; Krishna, Sahay., & Walsham., 2004).

Another reason of communication problems in software project offshore outsourcing is that, there is limited use of communication technology because most of small vendor companies cannot afford the expensive means of communication technology (Ahmed, Shabaz, Ammad, & Falak, 2011).

DISCUSSION

D. Systematic Literature Review Protocol for Communication and Coordination Challenges in

OSDO Relationships.

In our study we used a method which followed the guidelines (Kitchenham & Charters, 2007). We have also studied many other papers (Azeem & Khan, 2011; Steinmacher, Chaves, & Gerosa, 2011; Yaseen, Khan, & Alam, 2013), to get some guidance because these papers are also based on SLR.

The reasons for performing SLR is that it is fair, more thorough, less biased, rigorous and open (Kitchenham & Charters, 2007). As SLR has predefined procedures so we should start from the first phase of SLR such as planning the review and this paper is only a plan for the review.

1) Constructing of search terms

For constructing search terms relevant to our research questions, we have followed (Kitchenham & Charters, 2007) guidelines. We have design the following search terms.

Population: Offshore Software outsourcing relationships

Intervention: Communication and coordination Challenges/Barriers/Risks

Outcomes of relevance: Establishment of good relationships, strengthening software outsourcing relationships

RQ1: [What are the communication and coordination challenges]

INTERVENTION

in [offshore software outsourcing relationships] **POPULATION** that affect the

[the establishment of good software outsourcing relationships]

OUTCOMES OF RELEVANCE

The experimental design is not included in the research questions as we are open to all types of study and due to the fact that they do not appear to be standard study approaches in the area of software development outsourcing.

2) Search strategy

a) Trial search

A trial search was conducted using the following search string on IEEE Xplore, ACM, SpringerLink and ScienceDirect digital library. A similar approach for conducting trial search was used by (Azeem & Khan, 2011). (“Communication” OR “coordination” OR “cooperation”) AND (Challenges OR barriers OR risks OR problems) AND (“Software outsourcing” OR “IT sourcing” OR “offshore software outsourcing” OR “offshore software development outsourcing” OR OSDO) AND (Relationships OR relation)).

The papers retrieved through this search string we will use these as a guide for the development and validation of the major search terms.

3) Identifying Search Terms

For the construction of search terms the following search strategy is used which is also used by (Azeem & Khan, 2011):

- i. To derive the major terms from the research questions, identifying population, intervention and outcomes of relevance;
- ii. For these major terms identify alternative spellings and synonyms;
- iii. In any relevant paper verify the key words;
- iv. Use of Boolean Operators for conjunction if the database allows, in such a way, to use ‘OR’ operator for the concatenation of alternative spellings and

and synonyms whereas ‘AND’ for the concatenation of major terms.

- v. If required, Integrate the search string into a summarized form.

Result for a)

RQ1: Software outsourcing relationships, communication and coordination, challenges/barriers, practices/solutions

Result for b)

RQ1

Software outsourcing: (“Software outsourcing” OR “offshore software outsourcing” OR “information systems outsourcing” OR “information technology outsourcing” OR “IS outsourcing” OR “IT outsourcing” OR “CBIS outsourcing” OR “computer-based information systems outsourcing” OR “software contracting-out” OR “distributed software development” OR “multi-site software development” OR “global software development” OR GSD OR “offshore software development outsourcing” OR OSDO)

Relationships: (Relationships OR “teamwork” OR collaboration OR alliance OR associations OR partnerships OR dealings OR contract OR interaction OR relations OR affairs)

Challenges: (challenges OR problems OR barriers OR issues OR obstacles OR troubles OR hurdles OR “risk Analysis” OR “critical factors”)

Communication and coordination: (Communication OR coordination OR cooperation OR management OR control OR organization)

Practices: (Practice OR practices OR solutions OR exercise)

Result for c)

Communication and coordination problems, software outsourcing relationships, communication and coordination risks

Result for d)

RQ1

("Communication challenges in software outsourcing" OR "coordination challenges in software outsourcing" OR cooperation) AND (Practice OR practices OR solutions OR exercise) AND ("Software outsourcing" OR "offshore software outsourcing" OR "IS outsourcing" OR "IT outsourcing" OR "distributed software development" OR "global software development" OR GSD OR "offshore software development outsourcing" OR OSDO) AND (Relationships OR "teamwork" OR collaboration OR alliance OR associations OR partnerships OR contract OR relations) AND (challenges OR problems OR barriers OR issues OR risk OR "critical factors"). The above search strings is used for both RQs i.e. RQ1 and RQ2.

Result for e)

No result for e

4) Search string breakup:

The above search string is used as our search term. However, there are some databases/libraries like Springer link and Google scholar that do not allow lengthy search strings; therefore we will split the above search term into smaller substrings and will do separate search for each of these search strings. The substrings for the stated research question RQ1 is given below. Each search term in research question is divided into three sub search terms.

5) Substrings for RQ1

For constructing substrings we used the same process as used by (Azeem & Khan, 2011).

a) Search string 1

("Communication challenges in software outsourcing" OR Cooperation) AND (Practice OR practices) AND ("Software outsourcing" OR "offshore software outsourcing") AND

(Relationships OR "teamwork" OR collaboration) AND (challenges OR problems))

b) Search string 2

("coordination challenges in software outsourcing") AND (solutions OR exercise) AND ("IT outsourcing" OR GSD OR "offshore software development outsourcing" OR OSDO) AND (associations OR contract OR relations) AND (issues OR risk))

c) Search string 3

((Cooperation) AND (Practice OR practices) AND ("IS outsourcing" OR "global software development" OR "distributed software development") AND (alliance OR partnerships) AND ("critical factors" OR barriers))

6) Resources to be searched:

IEEEExplore, ACM Portal, ScienceDirect, SpringerLink, Google scholar, Willey Online Library and CiteSeer digital libraries are searched.

7) Search Constraints and Validation

We searched all the relevant papers published papers without putting any data boundary or constraints. A prior search was conducted using a set of major search terms ((Communication OR coordination OR cooperation) AND (Challenges OR barriers OR risks OR problems) AND (Software outsourcing OR "IT sourcing" OR "offshore software outsourcing") AND (Relationships OR relation)) after searching the following digital libraries we found certain relevant papers on IEEE Xplore, ACM, SciencesDirect and Springerlink etc. Prior to carry out the review process, for validation of search strings these relevant papers will be used.

8) Search Result Management

The results of each search will be stored in a directory as html pages. Moreover the primary selection list will

be in the following format. It should be noted that the Tracing no. is the no. found for a particular paper during its search. If a paper is referenced in more than one database, then it will be entered once in the final selection list to avoid duplication. The "S.No" field of the final list is the primary key for a paper being selected in the review.

9) *Publication selection criteria*

a) *Inclusion criteria*

We use inclusion criteria to determine that which piece of literature (papers, technical reports, or grey literature etc) found by the search term and then will be used for the data extraction. The criteria are listed below:

- Studies that describe communication or coordination challenges/issues in software outsourcing relationships
- Studies that describe practices/solutions for communication or coordination in software outsourcing relationships
- Studies that describe communication or coordination challenges affecting the continuation/termination of the outsourcing relationships

b) *Exclusion criteria*

This section describes the exclusion criteria in order to decide which piece of literature found by the search term will be excluded/ ignored. The criteria are listed below:

- Studies that is not relevant to the research question.
- Studies that don't describe communication or coordination challenges/problems in software outsourcing relationships.
- Studies that don't describe practices for the communication or

coordination problems in offshore software outsourcing relationships

- Studies other than offshore outsourcing

10) *Selecting primary sources*

Initial selection of the primary sources will be performed by reviewing the title, keywords and abstract. The purpose is to exclude/ignore only those results which have no relevance to the problem/research questions. The primary sources chosen in the initial selection process will be checked against the above mentioned inclusion/exclusion criteria by reviewing carefully through full text of the studies. The source will be sent to the secondary reviewer, for review in case of any uncertainty regarding the inclusion or exclusion decision.

11) *Publication quality assessment*

The measurement of quality is performed after final selection of publications. The quality checklist contains the following questions:

- Is it clear how communication or coordination challenges were measured in software outsourcing relationships?
Each of the above factors will be marked as "YES" or "NO" or "Partial" or "N.A"

A secondary reviewer will score a small subset for validation.

12) *Data Extraction Strategy*

a) *Primary Study Data*

The purpose of the study is to collect the data, from the publications, which is focused on satisfying the research questions for the review. The following data will be extracted from each publication.

- Publication details (Title, Authors, Journal/Conference title, etc.)

- Data that address the research questions.

To address the research questions, the following data will be extracted:

RQ1:

- Background information, communication and coordination challenges in software outsourcing relationships and solutions/practices for these communication and coordination challenges in software outsourcing relationships

13) Data Synthesis

Due to two research questions, the synthesis will also be categorized into two parts. For the Research Question1, the data will be synthesized by creating one summary table having the columns (S.No, challenge/barrier, Frequency, Percentages) showing the list of all the communication and coordination challenges along with their frequencies and percentages. The complete detail of every challenge mentioned in the Summary table will be recorded in a separate table which will hold these columns (Challenge group name, S.No of reference, Challenge subgroups, Paper reference/Paper title). For the Research Question2, the same process will be performed as for the RQ1 mentioned above.

II. CONCLUSION AND FUTURE WORK

Different studies have been done in the area of communication and coordination challenges in outsourcing relationships. But for the identification of communication and coordination challenges in OSDO relationships no systematic literature review process has been conducted. In this paper we discussed our study plan in the form of a SLR protocol. We have developed the

SLR protocol and currently we are in the implementation phase. Our expected outcomes will be the identification of communication and coordination challenges faced by vendors and clients in OSDO relationships. For the validation of our SLR outcomes and to find the practices for addressing these challenges we will conduct an empirical study in outsourcing industry. Our ultimate goal is the development of Communication and Coordination Challenges Mitigation Model (CCCMM) for OSDO relationship.

Acknowledgements

We are obliged to Software Engineering Research Group at University of Malakand (SERG_UOM) in general and to Muhammad Ilyas Azeem, Asad Khan and Abdul Wahid Khan in particular for the review and their valuable comments in validation process of the protocol.

REFERENCES

- Ahmed, F. S., Shabaz, A., Ammad, A., & Falak, S. (2011). THE Perspective, Motivators And Challenges of Offshore Software Devepoment. *Journal of Theoretical and Applied Information Technology*, 34(2).
- Ali-Babar, M., Verner, J., & Nguyen, P. (2007). Establishing and Maintaining Trust in Software Outsourcing Relationships: An Empirical Investigation. *The Journal of Systems and Software*, 80(9), 1438–1449.
- Azeem, M. I., & Khan, S. U. (2011). *Intercultural Challenges in Offshore Software Development Outsourcing Relationships: A Systematic Literature Review Protocol*. Paper presented at the 5th Malaysian Conference in Software Engineering (MySEC), Johor Bahru, Malaysia.
- Belcourt, M. (2006). Outsourcing - The Benefits and the Risks. *Journal of Human*

Resource Management Review, 16(2), 269-279.

Carmel, E., & Tjia., P. (2005). *Offshoring Information Technology: Sourcing and Outsourcing to a Global Workforce*. Paper presented at the Cambridge University Press, Cambridge, U.K.

CD., C. (2001). The mutual knowledge problem and its consequences for dispersed collaboration. *Organization Science*, 12(3), 346-371.

Chang, K. T. (2007). Out of Sight but Not Out of Mind? Informal Networks Communication and Media Use in Global Software Teams. Klarissa Chang and IBM Corp.

Clark, T. D., & Zmud, R. W. (1997). The Outsourcing of Information services: Transforming the Nature of Business in the Information Industry: Working paper, Florida State University, Tallahassee. Electronic source. coordination. Retrieved July 31, 2012, 2012, from <http://www.businessdictionary.com/definition/coordination.html>

Electronic source. (2000). IT Outsourcing: The Reasons, Risks and Rewards. Retrieved July 28, 2012, 2012, from <http://www.corpcomputerservices.com/articles/outsourcing-reasons>

Engineering, S. P.-q. s. (2012). Good (and Bad) Reasons to Outsource Software Engineering. Retrieved July 28, 2012, 2012, from <http://www.sitrusllc.com/good-and-bad-reasons-outsource-software-engineering>

Fabriek., & Matthias, D. o. I. a. C. S., Utrecht University, The Netherlands. (2007). Reasons for success and failure in

Offshore Software development projects.

Herbsleb, J., & Moitra, D. (2001). Global Software Development. *IEEE Software*, 18(2), 16-20.

Herbsleb, J. D. (2007). *Global software engineering: The future of socio-technical coordination*. Paper presented at the IEEE, Minneapolis, MN, USA.

Hossain, E., Bannerman., P. L., & Jeffery., R. (2011). *Scrum Practices in Global Software Development: A Research Framework*. Paper presented at the PROFES, Springer-Verlag.

Jimenez, M., Piattini, M., & Vizcaino, A. (2009). Challenges and Improvements in Distributed Software Development: A Systematic Review. *Hindawi Publishing Corporation Advances in Software Engineering*.

John, N., Sarah, B., & Ita, R. (2010, September). Global Software Development and Collaboration: Barriers and Solutions. *ACM Inroads*, 1, 66-78.

Kern, T., & Willcocks, L. (2000). Exploring information technology outsourcing relationships: theory and practice. *Journal of Strategic Information Systems*, 9(4), 321-350.

Kitchenham, B., & Charters, S. (2007). Guidelines for performing Systematic Literature Reviews in Software Engineering (Vol. 2, pp. 65): Keele University UK.

Krishna, S., Sahay., S., & Walsham., G. (2004). Managing cross-cultural issues in global software outsourcing. *Communications of the ACM*, 47(4), 62-66.

Lacity, M. C., & Hirschheim, R. (1993). *Information Systems Outsourcing: Myths, Metaphors, and Realities*. New York: John Wiley and Sons.

Layman, L., Williams, L., Damian, D., & Bures, H. (2006). Essential communication practices for extreme programming in a global software development team. *Information and Software Technology*, 48(9), 781–794.

Lings, B., Lundell, Bjorn., Agerfalk, P. J., & Fitzgerald. (2006). Ten Strategies For Successful Distributed Development. *International Federation for Information Processing (IFIP)*, 206, 119-137.

MacGregor, E., Y.Hsieh, & P.Kruchten. (2005). *The impact of intercultural factors on global software development*. Paper presented at the IEEE CCECE/CCGEI, Canada, Saskatoon.

Milewski, A. E., M. Tremaine, R. Egan, S. Zhang, F. Kobler, & P. O'Sullivan. (2008). Guidelines for effective bridging in global software engineering. *Journal of software maintenance and evaluation : Research and Practice*, 13, 477-492.

Nguyen, P. T., Muhammad Ali Babar, J., & Verner., M. (2006). *Critical Factors in Establishing and Maintaining Trust in Software Outsourcing Relationships*. Paper presented at the ICSE'06, Shanghai, China.

Palvia, P. C. (1995). A dialectic view of information systems outsourcing - pros and cons. *Information and Management*, 29(5), 265-275.

Sargent, A., Jr. (2006). *Outsourcing Relationship Literature: An Examination and Implications for Future Research*. Paper presented at the SIGMIS-CPR'06, Claremont, California, USA.

Sargent, A. J. (2006). *Outsourcing Relationship Literature: An Examination and Implications for Future Research*. Paper presented at the SIGMIS-CPR'06, Claremont, California, USA.

Steinmacher, I., Chaves, A., & Gerosa, M. (2011). Awareness Support in Global Software Development: A Systematic Review Based on the 3C Collaboration Model. *IT UNIVERSITY OF COPENHAGEN*.

Takac, F. P. (1994). Outsourcing: A key to Controlling Escalating IT Costs? *International Journal of Technology Management*, 9(2), 139-155.

Yalaho, A., & C.Wu. *IT-Supported International Outsourcing*. (Master's Thesis), University of Jyväskylä.

Yaseen, M., Khan, S. U., & Alam, A. U. (2013). Software Multi-Sourcing Risks Management From Vendor's Perspective: A Systematic Literature Review Protocol. *Gomal University Journal of Research*, 29(2), 1-8.