ABSTRACT—Software development outsourcing is a contract-based relationship between client and vendor organisations in which a client(s) contracts out all or part of its software development activities to a vendor(s), who provides agreed services for remuneration. The objective of this paper is to identify various barriers that have a negative impact on outsourcing clients in the selection process of offshore software development outsourcing vendors. We have performed a Systematic Literature Review process for the identification of barriers. We have identified barriers ‘language and cultural barriers’, ‘country instability’, ‘lack of project management’, ‘lack of protection for intellectual property rights’ and ‘lack of technical capability’ that are generally have a negative impact on outsourcing clients. The results also reveal the similarities and differences in the barriers identified in different continents. We suggest vendors have to address different barriers in order to compete in the offshore outsourcing business.

Keywords: Systematic Literature Review; Software Development Outsourcing, Vendors

I. INTRODUCTION

Many companies are adopting the Global Software Development (GSD) paradigm to reduce software development cost [1]. Many vendor organisations are struggling hard to better compete internationally for attracting outsourced software development projects. Due to the increasing trend of GSD we are interested to discover which barriers have a negative impact on the software development outsourcing clients in the selection of offshore software development outsourcing vendors. This paper presents an empirical study in which a Systematic Literature Review (SLR) [2] is conducted in order to identify these barriers. Identifying these barriers will lead software development outsourcing vendors in addressing those barriers in order to be fully ready for software development outsourcing initiatives. Our long term research goal is to provide software development outsourcing practitioners with a body of knowledge that can help them to improve GSD processes.

In order to reduce development cost, offshore software development outsourcing has become an important process of GSD. Software development outsourcing is a contract-based relationship between client and vendor organisations in which a client(s) contracts out all or part of its software development activities to a vendor(s), who provides agreed services for remuneration [3; 4]. Over the last decade, many firms in the US and UK have outsourced software development projects to offshore countries [5]. There are many reasons for software development outsourcing [6]. Client organisations benefit from offshore outsourcing because vendors in developing countries (offshore vendors) usually cost one-third less than onshore vendors and even less when compared with in-house operations [7]. Moreover offshore vendors improve their skills and service quality with the experience of offshore outsourcing projects, and they learn totally new ways to satisfy clients’ needs. It is professed that offshoring vendors can add significant value to their clients’ supply chains [8]. However, in addition to the outsourcing benefits there are many risks in an outsourcing process [9; 10].

Many problems have been reported in the offshore software outsourcing process. One of the key challenges is to handle complex communication and coordination problems in conditions of time and cultural separation [5; 9; 11; 12]. Other challenges are to develop software development outsourcing practices, creating confidence and trust among the outsourcing companies and to manage the expectations of what can and what cannot be done in a distributed setting [5; 13-18]. However, despite the importance of offshore software development outsourcing, little empirical research has been carried out on offshore software development outsourcing practices in general and identification of barriers that have a significant impact on client organisations in particular. To do this we intend to address the following research questions:

RQ1. What barriers within a software outsourcing vendor organisations have a negative impact on software outsourcing clients?

RQ2. Do the identified barriers vary from continent to continent?

This paper is organised as follows. Section 2 describes the background. Section 3 describes the research methodology. In Section 4 findings from the systematic literature review are presented and analysed with some discussion. Section 5 describes the limitations; Section 6 provides the conclusion and future work.
II. BACKGROUND AND MOTIVATION

In order to successfully design GSD initiatives, as researchers, we need to be constantly aware of what really undermine GSD processes. This will enable us to position our research within an appropriate context. It is important to discover which barrier will undermine GSD process, as research shows that half of the companies that have tried outsourcing have failed to realise the anticipated results [19]. The knowledge of these barriers may help us to develop new or improved GSD approaches, whose adoption will better match organisations’ objectives.

GSD activities have been going on for more than a decade. However, software development outsourcing companies are still facing many problems. A number of researchers have tried to address some of the issues of software development outsourcing, e.g. (Nguyen et al.[13]; Oza [20], Oza and Hall [21], Oza et al. [16], Sabherwal [22]). To highlight few of these: A study was conducted in the UK to manage the offshore software outsourcing relationships [20]. The focus of this study is around Indian software vendor organizations and their client organizations in US and European countries. A similar study was conducted by Nguyen et al. [13] to examine the offshore outsourcing relationships between the software vendors in Vietnam and their corresponding European and American clients. Sabherwal [14] has worked on the role of trust in software outsourcing relationships. Rajkumar et al. [23] have worked on the offshore software outsourcing risks, benefits and conditions that are applicable in the Indian software industry and corresponding clients in US. Sakthivel [24] has also identified various risks related with offshore outsourced software development projects. Narayanaswamy et al. [25] have worked on the management of offshore outsourced software development projects. They have proposed a research model in which culture is considered as a prime factor affecting the choice of control mechanisms in offshore outsourced software development projects [25]. Aubert et al. [26] have developed a framework for the completeness of outsourcing contracts and associate costs in order to minimize risks. They have conducted an empirical study in order to measure different levels of outsourcing contract.

The work in this paper complements work previously done in these studies. Most of the existing studies focus on the topics of ‘outsourcing relationship’ and ‘outsourcing trust’. Outsourcing relationships and outsourcing trust are important areas to address. However, despite the increasing importance and need for empirically tested body of knowledge on different aspects of GSD, little empirical research has been carried out in order to determine which barriers have a significant impact on software outsourcing clients in the selection process of offshore software development outsourcing vendors. The knowledge about these barriers will contribute in improving the readiness of offshore software development vendors as vendors organisations will try to address the barriers that have a negative impact on client organisations. In addition, understanding the GSD barriers will provide advice to GSD practitioners on what barriers to address when developing GSD strategies. In addition, no SLR has been performed on this topic. Research in this area is expected to provide useful information for outsourcing vendor organisations.

In this paper we present an empirical study in which a SLR is conducted in order to identify which barriers have a negative impact on the software development outsourcing clients in the selection of offshore software development outsourcing vendors. A good understanding of the issues involved in the selection of outsourcing vendors is expected to help vendor organisations to address these issues in order to compete internationally for attracting outsourced software development projects.

III. RESEARCH METHODOLOGY

We have used a Systematic Literature Review (SLR) process [2] as the main approach for data collection because a SLR is a defined and methodical way of identifying, assessing, and analysing published primary studies in order to investigate a specific research question. Systematic reviews differ from ordinary literature surveys in being formally planned and methodically executed. In finding, evaluating, and summarising all available evidence on a specific research question, a systematic review may provide a greater level of validity in its findings than might be possible in any one of the studies surveyed in the systematic review.

A systematic review protocol was written to describe the plan for the review, and this protocol is described in detail in a technical report [27]. The major steps in our methodology are:

- Determine the search strategy then perform the search for relevant studies;
- Perform the study selection process;
- Apply study quality assessment;
- Extract data and analyse the extracted data.

Details on the course of these steps are described in the following subsections.

A. Search Strategy, and Search

The search strategy for the SLR is a plan to:

- Construct search terms by identifying population, intervention and outcome
- Find the alternative spellings and synonyms
- Verify the key words in any relevant paper
- Use Boolean Operators

An initial scoping study was conducted to determine the resources to be searched, and the search terms to use for each resource. In this scoping study a trial search was conducted using the following search string on CiteSeer digital library:

("software outsourcing" OR “IT outsourcing" OR “IS/IT") AND ("vendor" OR "selection criteria" OR "readiness" OR "client" OR "factors" OR "barriers" OR "models")

The information retrieved through this search string was used as a guide for the development and validation of the
major search terms. The following final search string was used:

("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 facility management" OR "software contracting-out")

AND

((barriers OR barrier OR obstacles OR hurdles OR risks OR "risk analysis" OR "critical factors") OR ("selection process" OR "selection criteria" OR "recruitment procedure" OR choosing OR methodology OR "analyzing vendor’s capability" OR assessment OR "evaluation process" OR agreement OR contracting OR alliance OR co-ordination OR "outsourcing relationship") OR (vendor OR vendors OR service-provider OR dealer OR trader OR marketer OR seller OR developer) OR (Clients OR client OR outsourcer OR buyer OR customer OR purchaser OR user OR consumer OR shopper) OR (Undermine OR damage OR challenge OR challenge OR risks) OR ("negative impact" OR "relationship failure" OR "poor results" OR dissatisfaction OR disappointment OR displeasure OR disagreement OR "bad effect" OR "lack of trust" OR unconfident OR rejection OR "uncertain decision" OR conflict OR uncertainties))

2) Exclusion Criteria: Exclusion criteria are used to determine which piece of literature found by the search term will be excluded. The criteria are listed below:

- Studies that describe vendor’s capabilities for software outsourcing
- Studies that describe the barriers that have a negative impact on the software development outsourcing clients in the selection of offshore software development outsourcing vendors.
- Studies that describe the relationship between software outsourcer and vendor
- Studies that describe de-motivation in software outsourcing

C. Publication Quality Assessment

The measurement of quality is performed after final selection of publications. The quality of publications is assessed in parallel at the time of data extraction. The quality checklist contains the following questions:

- Is it clear how the barriers in the selection of software outsourcing vendor were identified?
- Is it clear how the vendor screening was performed?

Each of the above factors are marked as ‘YES’ or ‘NO’ or ‘NA’. The results of the study quality assessment were not used to limit the selection of publications.

D. Data Extraction

The review was undertaken by a single researcher, who was alone responsible for the data extraction. A secondary reviewer was approached for guidance in case of an issue regarding the data extraction.

The inter-rater reliability test was performed after the data extraction process by the primary reviewer. The secondary reviewer has selected 5 publications randomly from the list of publication already chosen by the primary reviewer. The secondary reviewer has independently extracted the data from the randomly selected publication.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Total Results found</th>
<th>Primary selection</th>
<th>Final selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEEExplore</td>
<td>468</td>
<td>155</td>
<td>26</td>
</tr>
<tr>
<td>ACM</td>
<td>195</td>
<td>58</td>
<td>30</td>
</tr>
<tr>
<td>Science Direct</td>
<td>567</td>
<td>58</td>
<td>21</td>
</tr>
<tr>
<td>Google Scholar</td>
<td>54</td>
<td>32</td>
<td>13</td>
</tr>
<tr>
<td>CiteSeer</td>
<td>16</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>1300</td>
<td>319</td>
<td>98</td>
</tr>
</tbody>
</table>
The results were compared with the results produced by the primary reviewer and no differences were found.

From each paper we extracted a list of Quotes, where each Quote described a list of barriers that have a negative impact on software outsourcing clients in the selection process of offshore software development outsourcing vendors.

The following data was extracted from each publication: Date of review, Title, Authors, Reference, Database, Critical Barriers, Methodology (interview, case study, report, survey etc), Target Population, Sample Population, Publication Quality Description, Organisation Type (software house, university, research institute etc), Company size (small, medium, large), Country/location of the Analysis and Year.

E. Data Synthesis

A primary reviewer with the help of secondary reviewer has performed data synthesis. At the end of the Data Extraction phase described in section 3.4 we had identified a list of barriers from the sample of 98 papers. The primary researcher reviewed these in order to derive a list of categories to classify these barriers and initially a list of 20 categories was identified. These were reviewed and some of these categories were merged together and in this way we got a final list of 16 barriers shown in Table II.

IV. RESULT

A. Barriers Identified through Systematic Literature Review

In order to answer RQ1, Table II shows the list of barriers identified through the SLR. ‘Language and cultural barriers’ (56%) is the most common barrier identified in our study. Over the last decade, many firms in the USA and UK have outsourced software development projects to other countries such as India, China, Russia and Malaysia where English is not the first language [28]. In addition these countries have different culture as compared to the UK and USA. Different studies have described the impact of language and Cultural differences on outsourcing business:

- In a study conducted in the UK and India, Sahay et al [5] have discussed different problems related to transfer of UK culture to India. They have also described the role of power and control during the outsourcing business.
- In another study [29] some political and cultural issues in the globalisation of software development have been examined.

Our results indicate that ‘country instability’ (51%) has a negative impact on software development outsourcing clients. By ‘country instability’ we mean political instability, corruption, peace problems, terrorism threats and uncertainty relating to trade and investment. Khan et al. [30] have also identified this barrier as a critical barrier in their study in India: “instability of the political situation could act as a discouragement for the foreign investors to offshore outsourcing in India. Speed to market is a very important factor in certain firms. Therefore, if the development process gets delayed due to impeding factors like strikes or power cuts, it becomes difficult to continue the process.”

Nearly half of the articles in our study described ‘lack of project management’ as a barrier that can have a negative impact on outsourcing clients. In the outsourcing process an effective project management plays a vital role as it has been a difficult task to manage the geographical distributed teams: Ofer, and Arik (2007) have found that improving the project planning is an effective tool in dealing with high-risk projects; Sun-Jen and Wen-Ming (2008) have reported the impact of project planning on project duration; and Linda et al. (2004) have described the lack of project planning as a risk to software projects.

Our results also indicate that ‘lack of technical capability’ (47%) can undermine the selection of competent vendor organisations. Research suggests that half of the companies that have tried outsourcing have failed to realise the anticipated results [19]. One of the reasons for software development outsourcing failures is the difficulties in creating confidence and trust among the outsourcing companies [4; 15]. We argue that addressing ‘lack of technical capability’ barrier can play a vital role in establishing a good relationship between client and vendor organisations as this will help vendor organisations to provide adequate technical services to client organisations. Different studies have also described the importance of this barrier:

- A high-quality skilled manpower is the backbone of the IT industry and vendors should employ high skilled workers with professional degrees in Computer Science, Engineering, Management and similar fields [31].
- Often a client organisation is eager to know the technical capability of vendor organisation [13].

Forty seven percent of the articles in our study describe ‘lack of protection for intellectual property rights’ as a barrier to outsourcing due to the fact that there is no such thing as an "international intellectual property right" that automatically protects anybody’s work throughout the world. Every country has its own national laws in order to protect individuals’ work against unauthorised use. However, it is always hard to implement these laws in order to address issues relating to intellectual property rights [30]. In addition, our results indicate that issue of intellectual property rights is critical and has great impact on outsourcing clients in the selection of outsourcing vendors.

Forty four percent of the articles in our study describe ‘communication gap’ as a barrier in outsourcing business. ‘Poor relationship management’ is also one the common barriers in our study, i.e. 44%. This suggests that poor relationship management has a negative impact on the outsourcing clients in the selection process of outsourcing vendors. Understanding different factors in managing software development outsourcing relationships can help to ensure the long lasting relationships between clients and vendors [4; 14; 32]. Different factors have been identified
to effectively manage relationships between clients and vendors such as credibility, capabilities and personal visits.

Forty three percent of articles in our study have cited a ‘poor quality of service and system/process’ as a barrier. We argue that in order to compete in an international outsourcing business vendor companies need to improve the quality of their processes and services. Indian software companies have been reported to provide high quality software [33] and this is the reason that in the software export market, India is a dominant software outsourcing provider [34].

We have also identified some other barriers that have a negative impact on client organisations as shown in Table II.

<table>
<thead>
<tr>
<th>Table II. List of Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Barriers</strong></td>
</tr>
<tr>
<td>Communication gap</td>
</tr>
<tr>
<td>Country instability</td>
</tr>
<tr>
<td>Delays in delivery</td>
</tr>
<tr>
<td>Hidden costs</td>
</tr>
<tr>
<td>Incompatibility with client</td>
</tr>
<tr>
<td>Lack of Project Management</td>
</tr>
<tr>
<td>Lack of protection for intellectual property rights</td>
</tr>
<tr>
<td>Lack of technical capability</td>
</tr>
<tr>
<td>Language and Cultural barriers</td>
</tr>
<tr>
<td>Lack of control over project</td>
</tr>
<tr>
<td>Poor quality of service and system/process</td>
</tr>
<tr>
<td>Opportunistic behaviour</td>
</tr>
<tr>
<td>Poor contract management</td>
</tr>
<tr>
<td>Poor infrastructure</td>
</tr>
<tr>
<td>Poor relationship management</td>
</tr>
<tr>
<td>Strategic inflexibility</td>
</tr>
</tbody>
</table>

B. Comparison of the barriers across various continents

Our results show the number of articles reporting studies related to different continents. Due to space limitation, in this paper we have only compared the barriers identified in three continents, i.e. Asia, America and Europe. Our aim is to find whether these barriers differ from continent to continent. We suggest that understanding the similarities and differences in these barriers can contribute to the body of knowledge of software development outsourcing. This is because where articles from different continents consider that a barrier has some impact on client organisations then that barrier needs to be taken very seriously by the vendor organisations in that continent.

Because of the ordinal nature of the data we have used the linear by linear association chi-square test in order to find significant differences between barriers identified in three continents. The linear by linear association test is preferred when testing the significant difference between ordinal variables because it is more powerful than Pearson chi-square test [35].

Comparison of the barriers identified in three continents indicates that there are more similarities than differences between the barriers. We have found only three significant differences between the three continents as shown in Table III. Our findings show that ‘country instability’ (65%, 43% and 71%), ‘lack of protection for intellectual property rights’ (52%, 46% and 47%), and ‘poor contract management’ (39%, 49% and 53%) are the most common barriers in all three continents. ‘Lack of project management’, ‘lack of technical capability’, ‘language and cultural barriers’, ‘poor quality of service and system/process’, and ‘poor relationship management’ are common barriers in Asia and Europe. Table III shows that clients in America and Europe want ‘control over project and they want to avoid outsourcing vendors who have ‘opportunistic behaviour’ in the outsourcing business. Our results indicate that outsourcing clients in America (43%) and Europe (59%) are having problems with ‘hidden cost’ during outsourcing business. ‘Communication gap’ is common in Europe (59%). Due to different cultures and languages in outsourcing business it is quite possible that a message is misunderstood by one or more of the outsourcing parties. In addition due to the geographical distributed teams in outsourcing business, face-to-face communication is not possible where one can clarify any misunderstanding. In the outsourcing processes the common methods for communications are email, phone and fax. However, in this modern age video conferencing is also emerging as a common communication tool.

These findings indicate that outsourcing clients are aware of the barriers that can undermine the whole outsourcing process. The purpose of this study is to explore different barriers that have a negative impact on outsourcing clients in the selection of outsourcing vendors. However, it is important to determine the reasons of why these barriers are commonly cited by the client organisations in Asia, Europe and America. We encourage independent studies on this topic.
TABLE III  SUMMARY OF BARRIERS ACROSS 3 CONTINENTS AS IDENTIFIED IN THE SLR

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Occurrence in SLR (n=98)</th>
<th>Chi-square Test (Linear-by-Linear Association)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Asia (N=23)</td>
<td>America (N=35)</td>
</tr>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
</tr>
<tr>
<td>Communication gap</td>
<td>08</td>
<td>35</td>
</tr>
<tr>
<td>Country instability</td>
<td>15</td>
<td>65</td>
</tr>
<tr>
<td>Delays in delivery</td>
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<td>26</td>
</tr>
<tr>
<td>Hidden costs</td>
<td>08</td>
<td>35</td>
</tr>
<tr>
<td>Incompatibility with client</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Lack of Project Management</td>
<td>15</td>
<td>65</td>
</tr>
<tr>
<td>Lack of protection for intellectual property rights</td>
<td>12</td>
<td>52</td>
</tr>
<tr>
<td>Lack of technical capability</td>
<td>10</td>
<td>44</td>
</tr>
<tr>
<td>Language and cultural barriers</td>
<td>13</td>
<td>57</td>
</tr>
<tr>
<td>Lack of control over project</td>
<td>05</td>
<td>22</td>
</tr>
<tr>
<td>Poor quality of service and system/process</td>
<td>11</td>
<td>48</td>
</tr>
<tr>
<td>Opportunistic behaviour</td>
<td>04</td>
<td>17</td>
</tr>
<tr>
<td>Poor contract management</td>
<td>09</td>
<td>39</td>
</tr>
<tr>
<td>Poor infrastructure</td>
<td>09</td>
<td>39</td>
</tr>
<tr>
<td>Poor relationship management</td>
<td>09</td>
<td>39</td>
</tr>
<tr>
<td>Strategic inflexibility</td>
<td>01</td>
<td>04</td>
</tr>
</tbody>
</table>

V. LIMITATIONS

How valid are our findings of barriers in the selection process of offshore software development outsourcing vendors? One possible threat to internal validity is that for any specific article, their reported barriers may not have in fact described underlying reason. We have not been able to independently control this threat. The authors of these studies were not supposed to report the original reasons why these barriers have a negative impact on outsourcing clients in the selection of outsourcing vendors. Many of the contributing studies were self-reported experience reports, case studies and empirical studies which may be subject to publication bias.

How safe is it to generalise these findings? Our sample contains many articles from many countries. Our findings are not based on any studies that used a random sample of software-developing outsourcing organisations in the world. However, in the investigation of our research questions, our study is the most comprehensive to date. The issue of generalising these findings can also be considered by comparing our findings with results from other related studies, as discussed in sections 4.1 and 4.2. We found many similarities in our findings and findings by other people, and this provides some support for generalisation.

VI. CONCLUSION AND FUTURE WORK

Our findings indicate that ‘language and cultural barriers’, ‘country instability’, ‘lack of project management’, ‘lack of protection for intellectual property rights’ and ‘lack of technical capability’ have a negative impact on software development outsourcing clients in the selection of software development outsourcing vendors. We suggest that outsourcing vendors should focus on these barriers in order to have a positive impact on outsourcing clients and to win outsourcing contracts. We have also compared these identified barriers across the reported datasets for the continents of Asia, Europe and America and found that there are more similarities than differences between the barriers.

We encourage independent studies on this topic. This will increase confidence in our findings and also track changes in attitudes to offshore outsourcing over time. Our ultimate aim is to develop a Software Outsourcing Vendors Readiness Model (SOVRM) [36]. This paper contributes to only one component of the SOVRM, i.e. the identification of the barriers. The eventual outcome of the research is the development of SOVRM to assist offshore outsourcing vendors in assessing their readiness for software development outsourcing activities. SOVRM will also
assist in improving software development outsourcing processes.

The SOVRM proposed will bring together and advance the work that has been undertaken on frameworks and models for outsourcing. Our contribution to improving software development outsourcing processes will provide other researchers with a firm basis on which to develop different outsourcing processes that are based on an understanding of how and where they fit into the software development outsourcing activities. New outsourcing practices could then be developed targeting software development outsourcing projects.

Many research outputs end up with a model or framework which never make it into industrial practice. We expect our work will reduce this trend in outsourcing by identifying a well understood and rationale outsourcing vendors' readiness model. Our aim is to help companies to avoid randomly implementing promising new models and frameworks just to see them be discarded.

ACKNOWLEDGEMENTS

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