Making the Sourcing Decision of Software Maintenance and Information Technology

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ABSTRACT Outsourcing has been getting a significant growth for the last few years. Organizations tend to outsource Information Technology (IT), primarily to take advantage of the availability of qualified, trained and skilled workforce in low cost countries across the globe. Outsourcing of IT and software maintenance seem very promising, but a number of factors, risks, and challenges associated with the outsourcing process that make the sourcing decision very complicated. The present study aimed at gaining in-depth understanding of the three aspects of outsourcing, namely; perceived benefits of IT outsourcing, influencing factors of IT outsourcing and software maintenance offshoring. The findings of the current study will lead us to develop a sourcing framework for outsourcing decision as well as a decision support system for software maintenance. A systematic literature review is performed that presents perceived benefits of IT outsourcing, the influencing factors of IT outsourcing and software maintenance. Furthermore, the identified factors are analyzed based on their occurrences in literature as well as chi square test is performed to derive the significant differences amongst the factors based on decades. Similarly, critical success factors are derived both for IT outsourcing and software maintenance offshoring. Our article shows that how the critical success factors impact the IT as well the software maintenance in global delivery perspective. The findings of the current study will help the IT experts and decision makers in making suitable sourcing decisions.

INDEX TERMS Software maintenance, critical success factors, sourcing decision, information technology, offshore outsourcing.

I. INTRODUCTION

Nowadays, organizations tend to outsource Information Technology (IT) primarily to take advantage of the availability of qualified, trained and skilled workforce in low cost countries across the globe. Similarly, offshore outsourcing has been getting a significant growth in the IT industry since the last few years. Outsourcing is a popular strategy in the developed countries where a remarkable increase can be seen in the level of outsourcing [1], [2]. The market size of outsourcing is continuously getting expansion, according to [3] the combined IT and business process outsourcing markets were worth US $373 and $424 billion in 2011 and 2014 respectively with the 4.4% annual growth rate.

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Similarly, the IT outsourcing market alone is expected to be US $64.3 billion between 2018 and 2021 with annual growth of 2.4%. Based on the criteria such as qualified work force, financial attractiveness and business environment the top six potential locations for offshore services are the Asian countries, namely China, India, Malaysia, Singapore, Philippine and Thailand [4], [5]. In order to get competitive advantages the organizations are constantly looking for new strategies and solutions. The outsourcing of services and products is one of the strategies that results into high level of competitiveness. A number of business functions are pervaded by outsourcing that includes IT, manufacturing, financial services, logistics and the management of human resources. The main categories of IT outsourcing are business process outsourcing, application development, application maintenance and infrastructure services [6]–[10].

Today, the IT budget of most organisations is consumed by application acquisition and maintenance services for applications. The maintenance cost of software is around 60% of the overall IT budget. The outsourcing strategy has changed software maintenance's objective from the service to keep the information system operational to the enhancement of the businesses' processes and to the achievements of business profits. So, the organizations' focus has shifted from lowering the cost to maximizing the benefits and cost saving up to 20-50% through offshore outsourcing [9]–[11]. Offshore outsourcing is a business practice for the development and maintenance of software at low cost. In offshore outsourcing a client gives its whole software or a part of it to a contractor who provides services from another country. After 2001, offshore software outsourcing grew significantly and continued to expand due to the recent economic downturn. In spite of the benefits of software offshore outsourcing and IT outsourcing a number of challenges have been observed in the literature. Some of the key challenges are communication, language, cultural difference, time zone difference, data privacy and security etc [12].

Despite the close resembles in IT outsourcing and software offshore outsourcing, a joint investigation of both IT outsourcing and software offshore outsourcing is very rare. A little research has been focused to identify the critical success factors of both IT outsourcing and software maintenance offshore outsourcing. All the aforementioned studies have focused either on IT outsourcing or software maintenance offshore outsourcing or benefits of IT outsourcing. Therefore, the current study is performed to gain an in-depth understanding of factors that highly impact the sourcing decision of IT outsourcing and software maintenance offshore outsourcing as well as the benefits of IT outsourcing. Accordingly, an SLR is conducted for the identification of influencing factors to assist the IT experts and managers in making appropriate sourcing decision.

A. STUDY OBJECTIVE AND RESEARCH QUESTIONS

The main objective of this research work is the identification and analysis of the influencing factors of IT outsourcing and software maintenance that have a significant influence on the sourcing decisions. To achieve the objective of the current research work, we will perform a systematic literature review. The identified factors will be analyzed on the basis of their frequencies and Chi square test (linear by linear association). Similarly, critical success factors will be derived from the identified factors on the basis of defined criteria. In addition to that, common critical success factor will be presented both for IT outsourcing and software maintenance offshoring. We believed that our findings will help the experts, IT managers and decision makers in selecting the suitable sourcing strategy. To address the aforementioned objectives, the current study is aimed at answering the following defined research questions.

RQ1. What are the perceived benefits of the IT outsourcing?

RQ2. What factors have high impact on IT outsourcing decisions?

RQ3. What are the factors that should be considered before making the offshoring decisions of software maintenance?

RQ4. How the identified factors affect the sourcing decisions?

RQ5. How to derive, common critical success factors for IT outsourcing and software maintenance concerning the sourcing decisions?

II. RESEARCH BACKGROUND AND MOTIVATION

The literature review, revealed that this area was targeted by various studies such as Mirko and Dalibor [13] have mentioned the IT outsourcing motivation factors which were further grouped together in four major factors, i.e. cost effects, organizational effects, financial effects and high efficiency effects. Uday [14] discusses that why organizations adopting IT outsourcing strategy and presented reasons for outsourcing such as cost reduction, the difficulty in finding IT professional and the acquisition of leading edge technology. Fraihat [15] investigated the IT outsourcing critical success factors in global delivery environment. A conceptual framework was proposed that assists the IT managers in making the sourcing decisions and to help the experts in evaluating the critical success factors. An empirical study was performed by Linden *et al.* [16] that identifies thirty seven factors of innovation by interviewing sixteen experts of outsourcing. Based on the identified factors an innovation model for IT outsourcing was developed. A study conducted at IBM Sweden by Rehman *et al.* [17] that results into a list of parameters. They developed a sourcing model based on identified parameters that helps the decisions makers in the selection of a suitable model for application maintenance. Väyrynen and Kinnula [18] conducted an empirical research by interviewing the experts of Finish International Company in the context of quasi outsourcing. The purpose was to highlight the most important success factors of quasi outsourcing and to make a comparison with conventional outsourcing. Moreover, three challenges and a number of factors as counter measure were presented for quasi outsourcing. By performing a systematic literature review, Khan *et al.* [19] identified a list of critical success factors. The factors can be used to evaluate the outsourcing decision and also help the client in the vendor selection. Similarly, by using systematic literature review, Ilyas *et al.* [20] found critical challenges for software integration in the context of global software development. The identified barriers were validated through an empirical study.

Although, a number of research studies have investigated the outsourcing of software development, factors of IT outsourcing, factors that influence application maintenance and various benefits of IT outsourcing. There is no single research study incorporating three aspects of outsourcing in one article, i.e. the perceived benefits of IT outsourcing, influencing factors for the outsourcing decisions of IT and software maintenance offshore outsourcing. The goal of the current
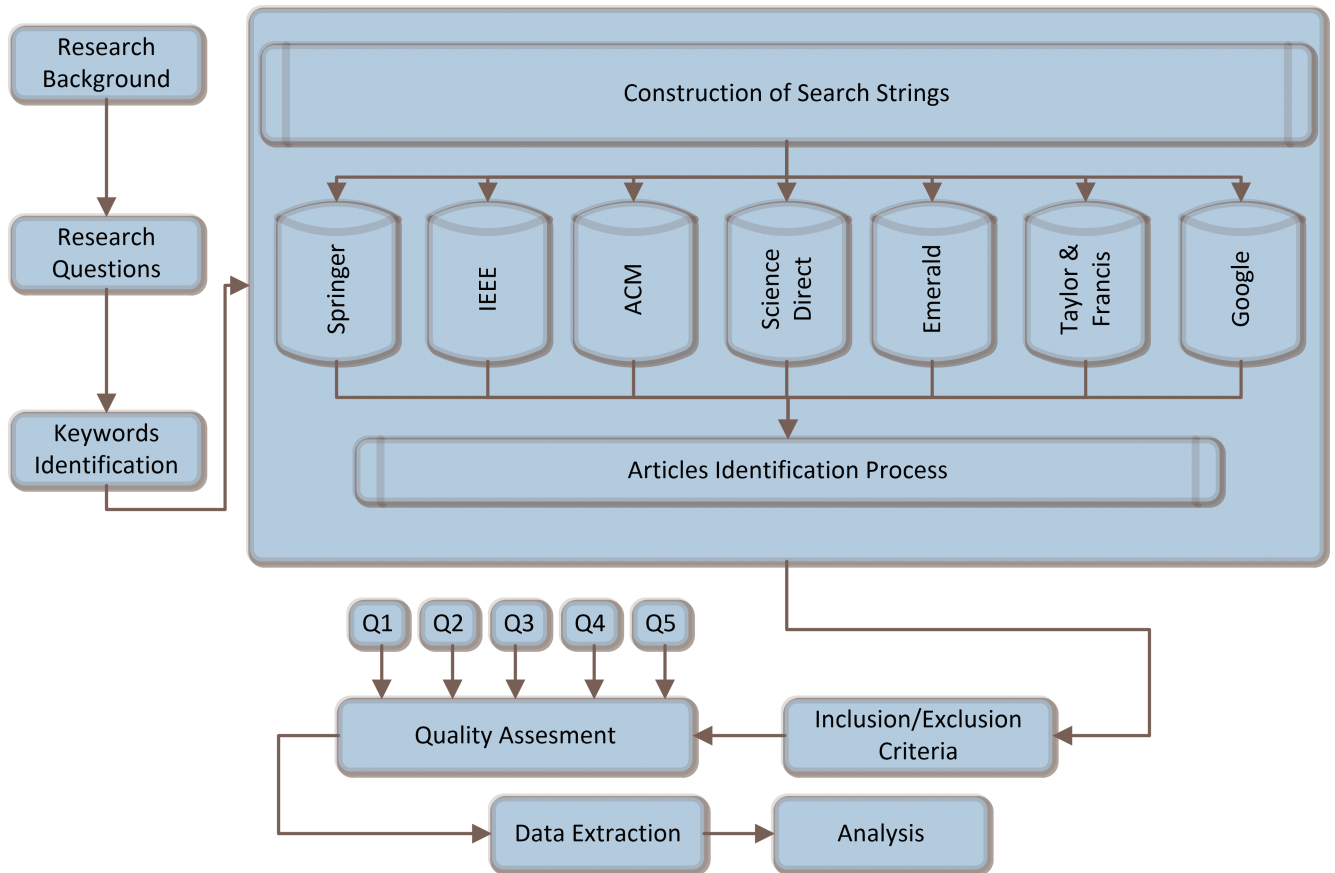
FIGURE 1. Study review protocol.

study is to gain a comprehensive understanding of these three aspects of outsourcing collectively. Our research will provide a detailed overview and thorough analysis of outsourcing decisions that could be useful to students, scholars, academia and sourcing decision makers. Similarly, the outcomes of this research work will assist the experts and IT managers to understand the complexities of projects and will help them in making effective and appropriate outsourcing decisions.

III. RESEARCH METHODOLOGY

In the current study, an SLR is performed to address the challenges of outsourcing decisions in terms of influencing factors of IT outsourcing as well as of software maintenance offshoring by following the guidelines of Kitchenham *et al.* [21]. In the field of Software Engineering, SLR is considered an invigorating research method for data collection. It is used to find, filter and assess the relevant literature to address formulated research questions as well as to minimize the research bias by using predefined protocol. The SLR consists of several activities which are categorized into three major phases such as to plan the review, to conduct the review and to report the review [21]. The designed protocol to be followed in the intended study as shown in Fig 1. The step-wise description of the review protocol and they way it is followed is shown in the subsections. The rest of paper is organized as follows:

Section IV presents results and discussion of the identified factors, section V presents study limitation while section VI shows the conclusion and future research work.

A. RESEARCH PROCESS

The research process is aimed at identifying of the appropriate materials against the research questions. A proper search procedure needs to be followed for the identification of the most relevant published documents, conference papers, articles, books and other materials. Digital libraries such as SpringerLink, IEEEXplore, ACM, ScienceDirect, Emerald and Taylor and Francis (T&F) as well as a search engine (Google Scholar) is chosen to be searched for the data regarding IT outsourcing and software maintenance offshore outsourcing.

The search strategy is used to construct search terms, find synonyms and making use of Boolean 'AND' and 'OR' operators. The keywords are information technology, application maintenance, outsourcing, offshoring, factors and benefits. Some of the alternatives are information system, software maintenance, distributed systems, parameters, barriers, challenges and advantages etc. The keywords and alternatives are combined to develop search strings by using Boolean 'AND' and 'OR' operators. In the current research, different strings were developed to collect the data regarding the perceived

TABLE 1. Initial identified list of articles, data sources and specific string for each digital library and Google Scholar.

Initial string Period:2000-2020	ScienceDirect	ACM	SpringerLink	Taylor & Francis	Emerald	IEEEXplore
"Application maintenance OR software maintenance " AND outsourcing OR offshoring AND influencing factors	8,852	251	2,177	17391	1,221	Null
Specific string for each database	Digital libraries			Results		
"Application maintenance OR software maintenance" AND global software development	ScienceDirect			170		
"Application maintenance OR software maintenance" AND outsourcing OR offshoring AND influencing factors	ACM			251		
"Application maintenance" OR "software maintenance" AND "outsourcing" OR offshoring	SpringerLink			69		
"Application maintenance" OR "software maintenance" AND outsourcing OR offshoring	IEEEXplore			361		
"Software maintenance" OR "application maintenance" AND outsourcing or offshoring	Taylor and Francis			45		
"Software maintenance" in global software engineering	Emerald			157		
Specific string for search engine (Period: 2000-2020)	Search Engine					
"Application maintenance OR software maintenance " AND outsourcing OR offshoring AND influencing factors	Google Scholar			70		
Total identified articles				1,123		

benefits of IT outsourcing, the influencing factors of IT outsourcing and important parameters of software maintenance outsourcing decisions.

Initially, a single search string ["Application maintenance OR software maintenance" AND outsourcing OR offshoring AND influencing factors], was applied to all selected digital libraries that resulted in huge lists of articles. In order to get the required data and best result as possible, the initial string was modified and a specific search string was developed for each library. All the digital libraries were searched manually with identified strings for the years 2000 to 2020 that resulted in a list of 1,123 articles. The initial search string and all other constructed specific strings along with their results are shown in Table 1.

B. STUDY SELECTION

The selection criteria of articles used in the current SLR are discussed in this section. The following subsections explain the criteria of inclusion as well as exclusion for the data collection. In addition, Fig 2, shows all the excluded articles and the list of final selected articles.

1) INCLUSION CRITERIA

The criteria of inclusion were used to find which part of the literature will be included in the extraction of data. A broad spectrum of searching was kept at the beginning in order to get a wider image of IT outsourcing and appli offshoring. Initially, all the papers regarding IT outsourcing, information system outsourcing, the benefits of IT outsourcing and software maintenance offshoring were considered. In the paper selection process, only the relevant papers to the research questions were shortlisted and others were ignored. The collected papers need to be further filtered down in order to meet the predefined inclusion and exclusion criteria and to select the papers that precisely focus on the current research area. The following inclusion criteria were followed.

- The articles that were published in the period 2000-2020;
- The research materials that are relevant to the research study questions;
- The articles and other papers that clearly discuss the benefits of IT outsourcing, influencing factors IT outsourcing and the factors that affect software maintenance offshore outsourcing;
- The published papers, books, reports and articles will be included.

2) EXCLUSION CRITERIA

In the current study, the following criteria were used to exclude the irrelevant and unimportant materials from the data gathered.

- Studies that were not published in English language;
- The duplicate papers;
- Studies which are irrelevant to the defined research questions;
- Studies that do not contain specifically the perceived benefits of IT outsourcing;
- Studies that do not reflect affecting factors of the offshore outsourcing of IT;
- Studies that do not pose the CSFs of software maintenance offshoring.

3) SELECTING PRIMARY SOURCES

We adopted a threefold approach for primary studies inclusion and exclusion that resulted in a total of 101 papers. Fig 2, shows the three filtering steps for the papers selection. In the initial phase, the papers were shortlisted from each data source, based on the titles reading. In the second phase, abstracts readings were performed that excluded the irrelevant papers whereas in the third phase, the shortlisted materials were further filtered by contents which ensures that
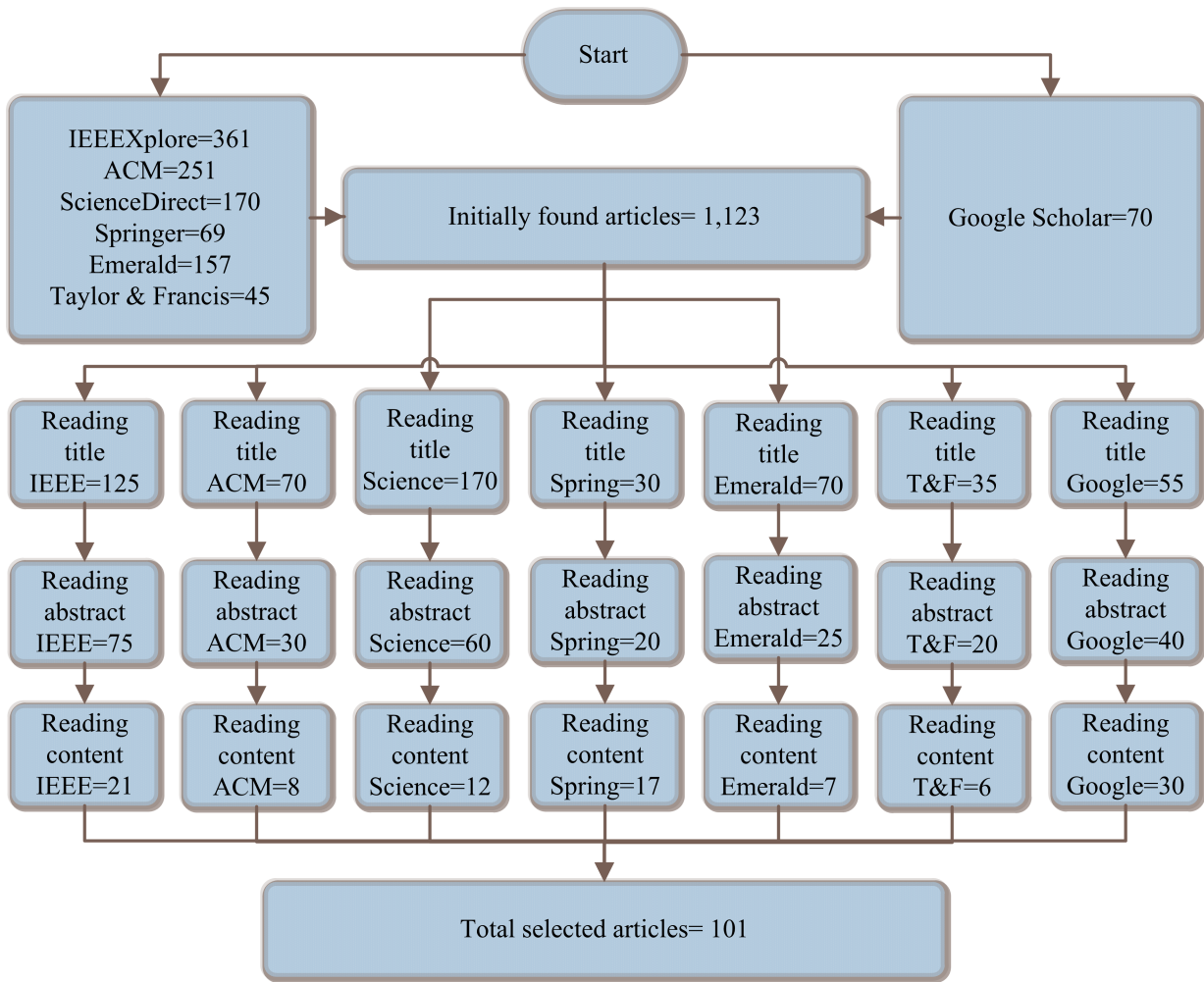
FIGURE 2. Threefold filtering process for papers inclusion and exclusion.

the finalized set of papers satisfy the selection criteria. This whole process of study selection produced a list of 101 papers for the current SLR.

C. QUALITY ASSESSMENT OF PRIMARY STUDIES

In the current phase, the finalized publications were evaluated against each research question to judge the quality of papers and their relevancy. Table 2, shows the designed checklist that was followed for the assessment of the selected papers. All the publications were assessed against the RQ1, RQ2, RQ3, RQ4 and RQ5 by assigning value of "0.5" to medium and "1" to high relevant papers.

Similarly, Fig 3, shows the number of collected primary studies from the chosen data sources, their respective scores, based on the designed checklist and year-wise publications of all the collected materials. It shows that out of 101 collected papers, 30 were downloaded from Google Scholar, 21 from IEEEXplore, 17 from SpringerLink and 8 from ACM. Similarly 12, 6 and 7 from ScienceDirect, T&F and Emerald respectively. It also shows the overall quality assessment

scores as well as citations of the collected papers. In Google Scholar, out of 30 papers, 7 were assigned 0.5 whereas, 23 papers were assigned 1. Similarly, the searched papers in IEEEXplore were given the score 0.5 and 1 to 6 and 15 papers respectively. Out of 17 papers in SpringerLink, only 4 have score 0.5 and the remaining 13 have score 1. The papers found in ACM were assigned score 0.5 to 2 papers and 1 to 6 papers. The quality score assigned to papers from ScienceDirect is 6 (.5) and 6 (1); T&F is 3 (.5) and 3 (1); and Emerald 1 (.5) and 6 (1).

Additionally, Fig 4 shows the types of total included papers in the current study such as articles (59), conference papers (30), books (4), reports (5) and workshops (3). Similarly, Table 3, contains only the selected studies, country of publication along with data analysis method of each study. Amongst the selected studies 35 papers show qualitative analysis, 33 papers quantitative analysis, 3 papers experiments and only 5 papers based on mixed data analysis method. Table 3, shows a list of 29 countries where the selected papers were published. USA has the highest publications 17 with (12 qualitative analysis), 4 (quantitative analysis) and 1 (experiment),

TABLE 2. Quality evaluation of selected papers based on the defined checklist.

Quality Evaluation	Checklist
Quality evaluation 1	Are the perceived benefits of IT outsourcing clearly discussed?
Quality evaluation 2	Are the influencing factors of IT outsourcing given?
Quality evaluation 3	Are the influencing factors of software maintenance presented?
Quality evaluation 4	Are the defined research questions addressed?
Score	Description
Score-1	The papers that meet the checklist criteria are assigned score '1'
Score-2	The papers that are not fully meet the checklist criteria are assigned score '0.5'
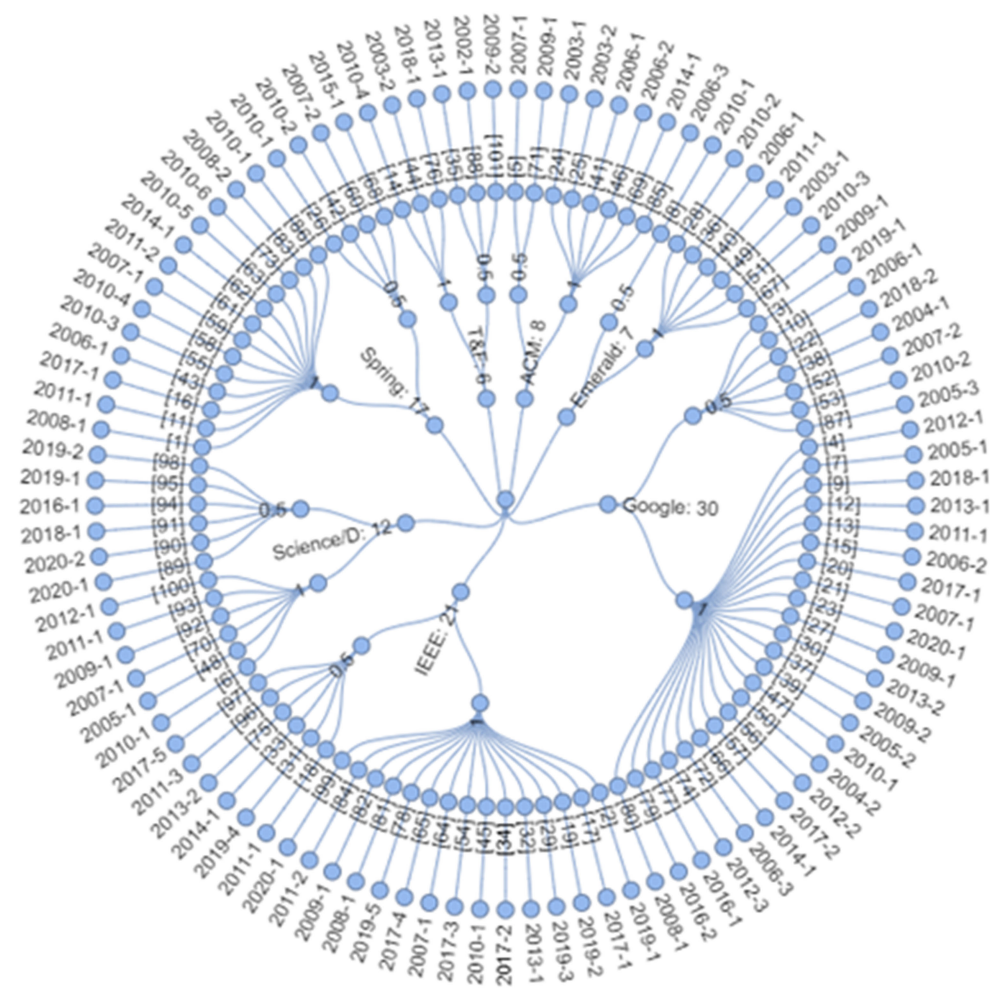
FIGURE 3. The number of articles collected from each data source as well as their quality assessment.

amongst the selected papers, which is followed by Germany with 8 papers, with (4 qualitative analysis), 2 (quantitative analysis) and 2 (mixed methods). Other notable countries are Pakistan with 5 papers including 5 quantitative analysis and UK with 5 papers that include 3 qualitative analysis and 1 qualitative analysis. Similarly, 4 papers were published each in China (1 qualitative and 3 quantitative analysis), Denmark (4 qualitative analysis) and India (3 quantitative analysis and 1 experiment) whereas Saudi Arabia (1 qualitative analysis and 2 mixed methods), Hong Kong (1 qualitative analysis and 2 quantitative analysis) and Netherlands (1 qualitative analysis and 2 quantitative analysis) each got 3 publications.

All other countries have the number of publications less than 3.

D. DATA EXTRACTION
The current literature review was performed by a single researcher who was alone responsible for data extraction. However, in the data extraction process, other reviewers were consulted for guidance. The significant data that were extracted are perceived benefits of IT outsourcing, factors that influence IT outsourcing, software maintenance offshore outsourcing and their common critical success factors as given in Table 4, 5, 7 and 8.

FIGURE 4. Total included articles, conference papers, books, reports, workshops and data sources.

E. META ANALYSIS

The findings of study were subjected to the process of analysis that is comprised of quantitative and qualitative analysis. The frequencies 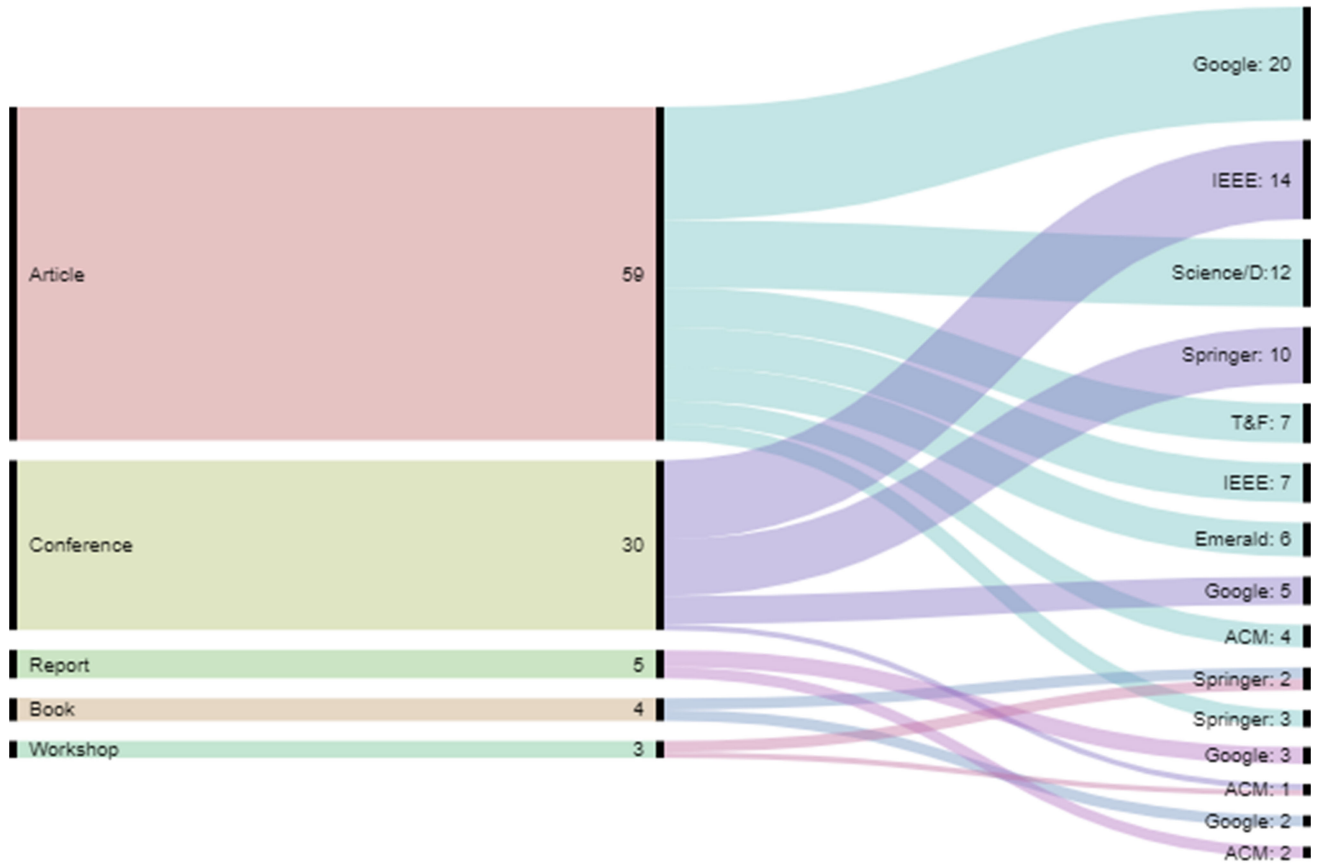and percentages of factors were calculated as given in Table 4, 5 and 7 respectively. Whereas, the Chi square test (linear by linear association) was performed which are given in Table 6 and 8. Similarly, the sources of collected papers, initial list of collected papers and the final list of collected papers are listed in Table 1 and Fig 2. The discussion of the identified factors regarding the sourcing decisions of IT as well as of software maintenance are given in detail in subsection D of section IV.

IV. RESULTS AND DISCUSSION

This section contains the findings of the current SLR against the formulated research questions which are given as follows: Subsections A, B, C, D and E reflect RQ1, RQ2, RQ3, RQ4 and RQ5, whereas, sections V and VI discusses study limitation and conclusion respectively.

A. PERCEIVED BENEFITS OF IT OUTSOURCING

In order to address the RQ1, we presented, 11 benefits of IT outsourcing. Table 4, shows the identified set of perceived benefits as well as the frequency and percentage of

each factor. Whereas, the following paragraphs contain the discussion of the perceived benefits that were identified in the current study.

The result shows that the perceived benefits of IT outsourcing in the selected papers which are more than 50%, are cost savings, focus on core activates, access to skills, improving quality, improving business processes and access to technology. The study reveals that the cost saving remains on the top by receiving 95% occurrences in the literature. The 'access to skills' is considered as one of the highest rated benefits of IT outsourcing that holds second position with 90% occurrences. Likewise, other benefits of IT outsourcing such as focus on core activities, access to technology and business innovation having equal importance with equally preferences of 62%, whereas, improving quality showed a slight decrease as appeared in literature with 57%. However, only five factors are less than 50%, which are achieving flexibility, scalability, access to global market, better management and increasing productivity with the values of 48%, 24%, 29%, 33% and 33% respectively.

B. INFLUENCING FACTORS OF IT OUTSOURCING

Table 5, shows a total of 14 influencing factors for IT outsourcing against the defined RQ2. These factors were

TABLE 3. Summary of the selected studies.

Country	Article No	Qual	Quan	Exp	Mixed	Country	Article No	Qual	Quan	Exp	Mixed
Spain	1	Yes				UK	19		Yes		
	27		Yes				39	Yes			
India	4		Yes				42	Yes			
	40		Yes				63		Yes		
	61		Yes				83	Yes			
	85			Yes		Australia	22	Yes			
Thailand	5	Yes				China	23		Yes		
USA	7	Yes					53		Yes		
	25	Yes					64		Yes		
	30	Yes					78		Yes		
	33	Yes				Hong Kong	24	Yes			
	36		Yes				38		Yes		
	41				Yes		77		Yes		
	43			Yes		Netherlands	26		Yes		
	44		Yes				48	Yes			
	46	Yes					80		Yes		
	47	Yes				Pakistan	29		Yes		
	49	Yes					55		Yes		
	50	Yes					56		Yes		
	54		Yes				65		Yes		
	67	Yes					79		Yes		
	70		Yes			Denmark	59	Yes			
	71	Yes					57	Yes			
	72	Yes					68	Yes			
Germany	10	Yes					69	Yes			
	16				Yes	Malaysia	31	Yes			
	28		Yes			Peru	32		Yes		
	45	Yes				Jordan	34		Yes		
	52	Yes				France	35	Yes			
	58				Yes	South/A	37		Yes		
	73		Yes			Canada	66		Yes		
	82	Yes					84	Yes			
Saudi Arabia	12				Yes	Argentina	86	Yes			
	15	Yes				Switzerland	74			Yes	
	75				Yes	Iran	76		Yes		
Slovenia	13		Yes			Austria	81	Yes			
Sweden	17		Yes			Norway	62	Yes			
Japan	60		Yes			Turkey	51	Yes			
Sum		18	13	2	5	Sum		17	20	1	0
Total		Qualitative/A = 18+17=35				Quantitative/A= 13+20=33		Experiments= 2+1=3		Mixed= 5	

TABLE 4. Identified list of the perceived benefits of IT outsourcing.

S.No	Perceived benefits	Selected articles for RQ1 (N=21) References	Fr	%
1	Cost reduction	[13], [22], [23], [24], [25], [26], [27], [28], [29], [30], [31], [32], [33], [34], [35], [36], [37], [38], [39], [40]	20	95
2	Focus on core activities	[13], [24], [26], [27], [28], [29], [31], [33], [34], [35], [37], [39], [40]	13	62
3	Access to kills	[13], [22], [23], [24], [25], [26], [27], [28], [29], [30], [31], [32], [33], [35], [36], [37], [38], [39], [40]	19	90
4	Improving quality	[13], [22], [23], [25], [26], [27], [28], [32], [34], [35], [36], [39], [40]	12	57
5	Achieve flexibility	[13], [26], [27], [28], [31], [33], [35], [36], [38]	10	48
6	business innovation	[4], [13], [23], [25], [26], [27], [30], [31], [32], [33], [34], [37], [39]	13	62
7	Access to technology	[4], [13], [23], [24], [25], [26], [27], [28], [31], [32], [35], [36], [38]	13	62
8	Increasing productivity	[13], [24], [26], [34], [37], [38], [39]	7	33
9	Better accountability	[4], [22], [29], [34], [36], [37], [38], [39]	7	33
10	Access to global market	[23], [26], [28], [29], [31], [33]	6	29
11	Scalability	[4], [26], [30], [31], [39]	5	24

identified by using 38 selected papers for IT outsourcing. The results show that cultural diversity is the most common cited factor (73%) among the identified factors for IT outsourcing. Similarly, cost and employees skills are the second most cited factors after the cultural diversity with each of 63% of preferences. Legal requirements have been ranked as third (57%) in the factors' list whereas infrastructure showed a slight decrease that follows the legal requirements with 55% of priority for the IT outsourcing decisions. Language barrier was cited by 52% of articles which shows its importance regarding the IT sourcing decisions. Our study shows that out of 14 factors, only 6 factors occurred more than 50%

TABLE 5. List of identified influencing factors of IT outsourcing.

S.No	Influencing factors	References	Fr	%
		Total selected papers for RQ2 (N=38)		
01	Cultural diversity	[5], [15], [16], [19], [30], [41], [42], [43], [44], [45], [46], [47], [48], [49], [50], [51], [52], [53], [54], [55], [56], [57], [58], [59], [60], [61], [62], [63]	28	73
02	Cost	[4], [15], [17], [19], [30], [41], [42], [44], [45], [46], [47], [49], [50], [51], [52], [53], [56], [57], [58], [60], [63], [64], [65], [66]	24	63
03	Legal requirements	[4], [15], [17], [19], [30], [42], [43], [44], [46], [47], [48], [50], [51], [52], [53], [55], [56], [57], [63], [65], [66]	21	55
04	Infrastructure	[4], [16], [19], [30], [42], [43], [45], [46], [48], [49], [50], [52], [53], [54], [55], [56], [58], [59], [60], [63]	20	52
05	Language barrier	[17], [19], [30], [41], [42], [43], [44], [45], [46], [47], [48], [52], [53], [56], [57], [59], [60], [61], [62], [63]	20	52
06	Poor communication	[1], [5], [15], [16], [41], [42], [43], [45], [52], [53], [54], [55], [57], [58], [59], [62]	16	42
07	Project management	[1], [15], [16], [19], [30], [42], [44], [52], [54], [55], [56], [57], [58], [61], [63], [64], [67]	17	44
08	Employees skills	[1], [4], [15], [16], [19], [30], [42], [44], [45], [46], [47], [49], [52], [53], [54], [55], [56], [57], [58], [60], [62], [63], [64], [65]	24	63
09	Time zone difference	[15], [16], [41], [43], [44], [45], [46], [48], [50], [51], [52], [53], [54], [55], [59], [61], [67], [68]	18	47
10	Knowledge transfer	[1], [4], [16], [19], [45], [48], [51], [52], [54], [55], [56], [63], [64], [67], [68]	15	39
11	Lake of social contact	[1], [47], [54], [60], [61], [62], [68], [69], [70]	9	29
12	Requirements changes	[4], [15], [16], [17], [44], [45], [48], [52], [60], [65], [66], [70]	12	31
13	Maturity level	[4], [15], [16], [17], [19], [30], [42], [45], [47], [52], [55], [56], [58], [62]	14	26
14	Domain knowledge	[15], [43], [45], [46], [47], [52], [53], [55], [60], [62], [67], [68]	12	31

TABLE 6. Decade-wise influencing factor of IT outsourcing.

Factors	Decade 1: 2000-2010 (N=24)		Decade 2: 2011-2020 (N=14)		Chi square test (linear by linear association) a=0.05	
	Freq	%	Freq	%	X2	P
	Selected articles for decade-wise factors identification (N=38)					
Cultural diversity	20	83	8	57	3.12789	0.07696
Cost	16	67	8	57	0.344671	0.5571
Legal requirements	13	54	8	57	0.0316793	0.8587
Infrastructure	14	58	6	43	0.849471	0.3567
Language barrier	13	54	7	50	0.0615741	0.804
Poor communication	12	50	4	29	1.66558	0.1969
Project management	10	42	7	50	0.248366	0.6182
Employees skills	15	62	9	64	0.0121173	0.9123
Time zone difference	14	58	4	29	3.14153	0.07632
Knowledge transfer	9	37	6	43	0.106211	0.7445
Lake of social contact	4	17	5	36	1.77486	0.1828
Changes in requirements	7	29	5	36	0.175443	0.6753
Maturity level	7	29	7	50	1.64931	0.1991
Domain knowledge	10	42	2	14	3.06807	0.07984

in the selected papers. It shows that these factors have a significant influence on the sourcing decision of IT. Both client and vendor need to consider these factors during the IT outsourcing.

Other notable factors are project management, time zone difference and poor communication that received 44%, 44% and 42% of occurrences respectively. All other factors got scores less than 40% which are knowledge transfer (39%), lack of social contact (29%), requirements changes (31%), maturity level (26%) and domain knowledge (31%).

1) IDENTIFICATION OF INFLUENCING FACTORS FOR IT OUTSOURCING BASED ON TWO DECADES

This section presents the identification of influencing factors across two decades, i.e. decade 1 (2000-2010) and decade 2

(2011-2020). The sample size for decade 1 and decade 2 is 24 and 18 papers respectively. Table 6, shows that only 8 factors appeared greater than 50% in the selected literature which are cultural diversity, cost, legal requirements, infrastructure, language barrier, employees skills, poor communication and time zone difference. Among the 8 factors, only 3 shows the growth across the two decades as given below:

- Legal requirements rise from 54% to 57%;
- Employees skills from 62% to 64%.

Whereas, 5 factors indicate a decline as follows:

- Cultural diversity from 83% to 57%;
- Cost from 67% to 57%;
- Infrastructure from 58% to 43%;
- Language barrier from 54% to 50%;

TABLE 7. Influencing factors of software maintenance offshoring.

S.No	Influencing factors	Total selected papers for RQ3 (N=38) References	Fr	%
01	Cultural diversity	[7], [10], [12], [15], [41], [42], [46], [48], [49], [52], [54], [56], [57], [59], [62], [67], [71], [72], [73], [74], [75], [76], [77], [78], [79]	25	66
02	Cost	[4], [7], [10], [12], [15], [17], [41], [42], [46], [49], [52], [53], [56], [62], [64], [66], [67], [71], [72], [73], [76], [79], [80], [81], [82], [83]	26	68
03	Legal requirements	[4], [7], [10], [12], [15], [17], [44], [46], [48], [52], [56], [57], [66], [67], [72], [73], [75], [78], [79], [80], [83], [84]	22	57
04	Infrastructure	[7], [10], [42], [44], [46], [48], [49], [52], [53], [54], [56], [57], [59], [72], [75], [78], [81], [83], [85]	19	50
05	Language barrier	[7], [10], [17], [41], [42], [44], [46], [48], [53], [56], [57], [59], [67], [72], [74], [78], [79], [80], [81], [83]	20	52
06	Poor communication	[12], [15], [41], [46], [54], [59], [62], [75], [78], [82], [83]	11	28
07	Project management	[12], [15], [41], [42], [52], [56], [57], [67], [72], [73], [78], [84], [86]	13	34
08	Employees skills	[7], [15], [42], [44], [48], [49], [52], [53], [54], [56], [57], [64], [66], [67], [72], [74], [76], [78], [79], [84], [85]	21	55
09	Time zone difference	[7], [10], [15], [41], [46], [48], [52], [59], [67], [74], [75], [78], [79], [86]	14	36
10	Knowledge transfer	[4] , [7], [10], [12], [48], [52], [54], [56], [64], [67], [73], [75], [77], [78], [79], [80], [83], [86]	18	47
11	Changes in requirements	[4], [7], [15], [17], [48], [52], [53], [62], [71], [73], [76], [78], [79], [80], [82], [83]	16	42
12	Maturity level	[7], [15], [17], [42], [44], [52], [56], [62], [72], [73], [76], [77], [79], [80], [83], [85]	16	42
13	Domain knowledge	[7], [46], [48], [52], [62], [67], [74], [78], [79], [82], [83], [85], [86]	13	34
14	Service scope	[7], [15], [48], [62], [71], [73], [83], [84]	8	21
15	Size of engagement	[48], [54], [62], [86]	4	10

- Poor communication from 50% to 29%.

We performed Chi square test (linear by linear association) of the identified factors which are based on two decades. Table 6, shows that there is no significant difference among the influencing factors.

C. INFLUENCING FACTORS REGARDING THE SOFTWARE MAINTENANCE OFFSHORE OUTSOURCING

In response to RQ3, as formulated in our study, Table 7, shows the identified list of factors (15 factors) that affect the sourcing decision regarding software maintenance. These factors were determined by using a total of 38 selected papers for software maintenance regarding offshore outsourcing decision.

The result shows that the cultural diversity is the most common factor (68%) among the identified factors which indicates that cultural diversity has a high influence on the application maintenance outsourcing decision. Similarly, after the cultural diversity, cost is the second highest factor (65%). Thus, low cost of application maintenance motivates the offshore outsourcing decision. The table also shows that both the legal requirements and employees skills are influencing factors (57% and 55%) of software maintenance regarding offshore outsourcing decisions. The result shows that infrastructure (50%) and language barrier (52%) also influence the sourcing decision. Thus, prior to outsourcing decision both factors should be analyse carefully. Out of identified factors (15), only 6 factors' scores are more than 50%.

Out of 15 factors, 9 got score less then 50% regarding their impact on sourcing decisions. Among the 9 factors only three factors appeared more than 40% i.e. knowledge transfer,

frequent requirements changes and maturity level received 47%, 42% and 42% respectively. These factors are also considered important regarding their impact on sourcing decisions. The remaining 6 factors are time zone difference (36%), poor communication (28%), project management (34%), domain knowledge (34%), service scope (21%) and size of engagement (10%).

1) DECADE-WISE IDENTIFICATION OF INFLUENCING FACTORS REGARDING SOFTWARE MAINTENANCE OFFSHORE OUTSOURCING

Table 8, presents the overview of identified factors based on two decades. The selected papers for the identification of factors concerning software maintenance offshoring were grouped into two decades, i.e. decade 1 (2000-2010) and decade 2 (2011-2020). Out of 38 papers, 21 were grouped in decade 1 while decade 2 consists of 18 papers.

The obtained result that is based on two decades, shows that five factors appeared more than 50% in decade 1. These factors are cultural diversity, cost, legal requirements, infrastructure, language barrier and employees skills. Whereas, only 3 factors in decade 2 having values more than 50% which are cultural diversity, legal requirements and employees skills. The table, also indicates a decline in 6 factors from decade 1 to decade 2 as given below:

- Cultural diversity from 67% to 61%;
- Cost 86% to 44%;
- Legal requirements from 57% to 55%;
- Infrastructure from 67% to 68%;
- Language barrier from 67% to 33%;
- Employees skills from 57% to 50%.

TABLE 8. Identification of influencing factors regarding software maintenance offshoring based on two decades.

| Factors | Selected papers for factors identification (N=38) | | | | | |
| | Decade 1: 2000-2010 (N=21) | | Decade 2: 2011-2020 (N=18) | | Chi square test (linear by linear association) a=0.05 | |
	Freq	%	Freq	%	X2	P
Cultural diversity	14	67	11	61	0.13	0.7184
Cost	18	86	8	44	7.42857	0.00642
Legal requirements	12	57	10	55	0.00993125	0.9206
Infrastructure	14	67	5	28	5.86711	0.01543
Language barrier	14	67	6	33	4.31053	0.03788
Poor communication	6	29	5	28	0.00301484	0.9562
Project management	8	38	5	28	0.464286	0.4956
Employees skills	12	57	9	50	0.19898	0.6555
Time zone difference	10	48	4	22	2.71673	0.0993
Knowledge transfer	10	48	8	44	0.0393046	0.8428
Changes in requirements	10	48	6	33	0.817547	0.3659
Maturity level	10	48	6	33	0.817547	0.3659
Domain knowledge	9	43	4	22	1.85714	0.173
Service scope	6	29	2	11	1.81221	0.1782
Size of engagement	2	9	2	11	0.0265306	0.8706

Chi square test (linear by linear association) was performed as given in Table 8, that shows the significant difference among three factors, i.e. cost, infrastructure and language barrier.

D. DISCUSSION OF THE IDENTIFIED FACTORS

The current study presented 15 factors for software maintenance offshoring and 14 factors for IT outsourcing. The impact of these factors is briefly discussed in the following paragraphs.

Cultural diversity: The current study shows that cultural diversity is the most prominent factor in IT outsourcing and maintenance offshoring that achieved values of 73% and 65% respectively. The cultural diversity becomes more challenging, if the vendors do not have their offices in the clients' countries [48]. Culture clash has always been a challenge, in offshore outsourcing due to which global delivery is not a smooth ride for service providers [49], [87]. Hence, the vendors and clients need to be aware of the culture issues while making outsourcing decisions in order to get smooth global services.

Cost: Cost is the second high weighted factor that scored 63% and 65% in IT outsourcing and maintenance offshoring. It is the main factor that drives IT outsourcing and enables the organizations to adapt offshoring strategy in order to cut down the overall project cost. Onshore presence of resources increase both the transaction cost and production cost of the vendor that affect the client accordingly. Likewise, the offshore characteristics such as culture difference, time zone difference, language barrier and unsuccessful knowledge transfer may lead to additional charges that may increase the outsourcing engagement cost [10], [74], [85], [88].

Legal requirements: Offshore outsourcing brings out a variety of challenges; amongst them legal requirements are considered as one of the important factors that affect the outsourcing decisions. The current study shows that legal requirements are the third highest factor that gained the value of 57%. Legal issues including data protection, confidentiality, Intellectual Property (IP) protection, labor and employments rights, exports and imports restrictions, privacy and data transfer restrictions, government approval for offshoring, taxes and currency exchange [7]. However, the most critical issue observed during this study is intellectual property protection that needs to be carefully analyzed before taking the outsourcing decisions.

Infrastructure: Our study result depicts that infrastructure is one of the high influencing factors in the context of both offshoring strategy and IT outsourcing that received 55% and 52% occurrence. The unstable telecommunication infrastructure can hinder the service delivery process [48]. In some countries a poor communication infrastructure could be a serious drawback that may affect badly the service quality and its delivery, specifically in the offshored projects. Infrastructure includes internet connectivity, data communication, network, servers, application management and data centers. Studies result [2], [52] showed that a company with the stronger IT's infrastructure and standardized processes are mostly engaging offshore outsourcing.

Language barrier: The language constraint was found one of the most influential factors for IT outsourcing and offshore outsourcing decision that got 52% preferences in our study. The quality of service and ease of interaction between the different sites' employees may be affected directly by the language barrier [10]. According to [81] the provider staff should be native speakers to support the helpdesk services on the remote site, and should be able to speak frequently the client' language otherwise the communication gap will be resulted. Language difference may create issues during the requirements gathering phase in outsourced projects and the collected requirements may not reflect the customers' needs [45], [89].

Communication gap: The factor communication gape received 42% and 28% preferences. This factor highly affects the service delivery in offshore outsourced projects. As a

result of communication gape the workforce does not know what to do as well as they do not understand really who to ask. The message will not be clearly communicated which will lead to higher risk. Thus, in global software development the poor communication leads to high number of defects and low productivity [5], [45], [90], [91].

Knowledge, skills and IT capability of employees: The findings of the study indicate that employees' skills positively affect the IT outsourcing and maintenance offshoring which motivate the outsourcing decisions. The employees' skills occurrences in the current study are 63% and 52% respectively. High quality skilled staff is the backbone of IT industry. The offshore service providers should employ skilled and experienced resources [12]. The offshore location with more technical capabilities and experienced resources is capable of quality service delivery and also able to meet the deadlines [30]. People with less technical expertise and experience could make lots of mistakes that may increase the failure rate. The inexperienced employees are not able to easily solve the problem without the proper guidance and support [45]. Shortage of IT resources in developed countries is one of the reasons for making global outsourcing. On the contrary, Eastern Europe and India have thousands of programmers and developers. During IT outsourcing the client gets services from the vendor and their programmers are capable to deliver high quality products [49]. The IT capability of the client firm has an impact on service delivery as well as on the adoption and usage of services [64].

Project management: The occurrences of project management in the literature are 44% and 34% for IT outsourcing and maintenance offshoring. In distributed projects various parts of the project has to be split, sent to offshore location, monitored and delivered from geographically separate country which takes extra management overheads. Likewise, in the distributed environment scheduling and task assignment become more complicated due to the factors such as frequently changing requirements, lake of informal communication and synchronization. Thus, it calls for deeply focus on project and relationship management [1], [11]. Thus, the reliable contract management and better client-vendor relationship can handle the challenges posed by outsourcing [12], [92], [93].

Time zone difference: The factor time zone difference achieved scores of 44% and 36% that shows its high impact on outsourced projects. Physical distance between the service providers and clients may lead to a number of challenges in offshore outsourcing [50]. Project management becomes more difficult as compared to onshore and nearshore projects. It greatly affects the organizational communication such as day to day interaction of employees [41], [71]. Time zone difference can delay the communicative process which affects coordination, monitoring and knowledge transfer among the teams and also increases the required efforts for task completion and also increased the coordination cost [10], [59], [94], [95].

Knowledge transfer: This factor gained 39% and 47% of preferences in the current study. It is considered an ubiquitous outsourcing challenge. The knowledge transfer in offshore outsourcing needs high social collaboration and enhanced support because of different learning approaches used in distributed projects as well as of culture differences [10]. Some outsourced applications do not meet the initial expectations. One of the failure reasons is the unsuccessful transfer of knowledge to the offshore team. Firstly, the knowledge is transferred to onsite coordinator then it is forwarded to offshore team. Unsuccessful knowledge transfer may yield extra time, management and cost [74]. Client and vendor keep a cordial relationship over the time through the knowledge sharing in outsourcing environment [12], [96]–[98].

Lack of adequate social contact: This factor was only observed in the domain of IT outsourcing. The study shows that the ratio of lake of adequate contact is 23% in IT outsourcing. The workforce on both sides, i.e. client and offshore sites are not able to get along with each other that create trust issues. Each of them think that the other is not able to understand him [45].

Requirements changes: Among the selected papers of IT outsourcing and maintenance offshoring, only 31% and 39% highlighted, frequent requirement changes as the influencing factor. During the project execution any change in business process causes changes in requirements [48]. If the requirements are changed then frequent sessions of discussions are needed with client to adjust the changes. The language and culture obstacles may complicate and hamper the requirements gathering phase [45]. Likewise, changes in the project scope my adversely affect the service delivery [48], [99], [100].

Maturity level: This factor includes process maturity and global experience that received priority of 36% and 39% respectively. Matured processes enable the service provider to continue development in shifts as well as to work around the clock in order to complete the project quickly. Matured companies are capable to cope with global challenges and receive global services comparatively easily than immature client [45]. On the other hand, lack of global delivery experience on the vendor side may cause delay in services in the initial stage of contract [47].

Domain knowledge: The domain knowledge is another influencing factor that was mentioned by 31% and 34% of the selected papers in the current study. The employees of client side believe that sometime offshore team does not have enough knowledge about the client business [69]. Thus, lacking the expertise and knowledge in the client domain may arise various outsourcing challenges. Similarly, it is difficult to transfer the domain knowledge to offshore team [87].

Service scope: The study results show that service scope was appeared in 26% of the total selected papers. It includes functionality scope and size of engagement (long term/short term project). Long term engagement provides financial stability as well as increased revenue to service providers [88]. Likewise, the length of the contract gives opportunity to

TABLE 9. Identified common critical success factors of IT outsourcing and software maintenance offshoring.

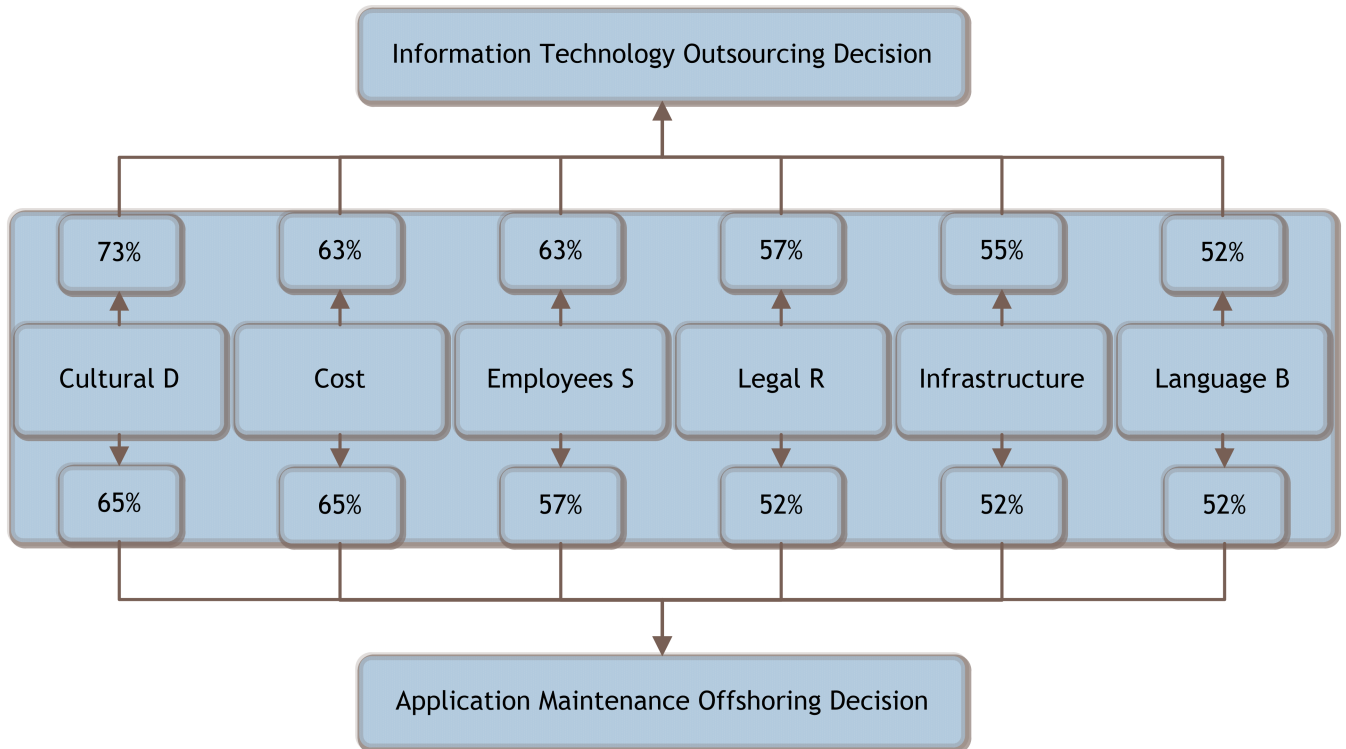| S.No	Critical success factors	Information technology outsourcing		Software maintenance offshoring	
		Freq	%	Freq	%
1	Cultural diversity	28	73	25	65
2	Cost	24	63	25	65
3	Employees skills	24	63	22	57
4	Legal requirements	22	57	20	52
5	Infrastructure	21	55	20	52
6	Language barrier	20	52	20	52

FIGURE 5. Sourcing decision of IT outsourcing and software maintenance offshoring based on common critical success factors.

service provider, to cover cost, but long term contract, cases the client, in lock in [48][48]. However, more coordination is required in big project that includes traveling to client site and high communication between the client and vendors teams [45], [101].

E. COMMON CRITICAL SUCCESS FACTORS OF IT OUTSOURCING AND SOFTWARE MAINTENANCE OFFSHORE OUTSOURCING

To answer the RQ5, the following paragraphs explain the determination of common critical success factors among the identified factors regarding the IT outsourcing and software maintenance offshoring. By using a systematic review a total of 14 and 15 factors were identified as mentioned in Table 5 and Table 7.

Amongst the 14 influencing factors of IT outsourcing only 6 factors were ranked as critical. Similarly, out of 15 factors only 6 were tagged as critical in the identified factors of software maintenance offshoring as shown in Table 9. The

factors were named critical that appeared more than 50% in the selected primary studies. This criteria for the identification of CSFs was adopted by other scholars [54], [56], [77].

Fig 5, shows the derived, common critical success factors for both IT and software maintenance. It shows the preferences of identified critical success factors, for both IT outsourcing and software maintenance. Cultural diversity is the most cited factor in the selected papers for both IT outsourcing and software maintenance. In both data sets the cultural diversity has the highest scores which are 65% in maintenance offshoring and 73% in IT outsourcing. Therefore, both the client and vendor need to take into account this factor prior to global sourcing. Cost is the second highest CSF in both data sets, with almost the same value of 65% and 63%, which indicates the significance of cost in the global outsourcing decision. Similarly, the employees skills stand on top after cultural diversity and the cost in both IT outsourcing and maintenance offshoring with 57% and 63%. The statistics show the importance of employees skills for both

TABLE 10. References traceability table.

	Citation				Citation		
Ref#	Table 3: Perceived benefits of ITO	Table 4: Influencing factors of ITO	Table 6: Influencing factors of SMOO	Ref#	Table 3: Perceived benefits of ITO	Table 4: Influencing factors of ITO	Table 6: Influencing factors of SMOO
1	No	Yes	No	49	No	Yes	Yes
4	Yes	Yes	Yes	50	No	Yes	No
5	No	Yes	No	51	No	Yes	No
7	No	No	Yes	52	No	Yes	Yes
10	No	No	Yes	53	No	Yes	Yes
12	No	No	Yes	54	No	Yes	Yes
13	Yes	No	No	55	No	Yes	No
15	No	Yes	Yes	56	No	Yes	Yes
16	No	Yes	No	57	No	Yes	Yes
17	No	Yes	Yes	58	No	Yes	No
19	No	Yes	No	59	No	Yes	Yes
22	Yes	No	No	60	No	Yes	No
23	Yes	No	No	61	No	Yes	No
24	Yes	No	No	62	No	Yes	Yes
25	Yes	No	No	63	No	Yes	No
26	Yes	No	No	64	No	Yes	Yes
27	Yes	No	No	65	No	Yes	No
28	Yes	No	No	66	No	Yes	Yes
29	Yes	No	No	67	No	Yes	Yes
30	Yes	Yes	No	68	No	Yes	No
31	Yes	No	No	69	No	Yes	No
32	Yes	No	No	70	No	Yes	No
33	Yes	No	No	71	No	No	Yes
34	Yes	No	No	72	No	No	Yes
35	Yes	No	No	73	No	No	Yes
36	Yes	No	No	74	No	No	Yes
37	Yes	No	No	75	No	No	Yes
38	Yes	No	No	76	No	No	Yes
39	Yes	No	No	77	No	No	Yes
40	Yes	No	No	78	No	No	Yes
41	No	Yes	Yes	79	No	No	Yes
42	No	Yes	Yes	80	No	No	Yes
43	No	Yes	No	81	No	No	Yes
44	No	Yes	Yes	81	No	No	Yes
45	No	Yes	No	83	No	No	Yes
46	No	Yes	Yes	84	No	No	Yes
47	No	Yes	No	85	No	No	Yes
48	No	Yes	Yes	86	No	No	Yes

TABLE 11. Reference traceability table for perceived benefits of IT outsourcing.

	Perceived benefits of IT outsourcing										
References	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
4	No	No	No	No	No	Yes	Yes	No	Yes	No	Yes
13	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
22	Yes	No	Yes	Yes	No	No	No	No	Yes	No	No
23	Yes	No	Yes	Yes	No	Yes	Yes	No	No	Yes	No
24	Yes	Yes	Yes	No	No	No	Yes	Yes	No	No	No
25	Yes	No	Yes	Yes	No	Yes	Yes	No	No	No	No
26	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
27	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
28	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes	No
29	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	No
30	Yes	No	Yes	No	No	Yes	No	No	No	No	Yes
31	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes
32	Yes	No	Yes	Yes	No	Yes	Yes	No	No	No	No
33	Yes	Yes	Yes	No	Yes	Yes	No	No	No	Yes	No
34	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	No	No
35	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No	No
36	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	No	No
37	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	No	No
38	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	No	No
39	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes
40	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No

TABLE 12. Reference traceability table for influencing factor of IT outsourcing.

References	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14
1	No	No	No	No	No	Yes	Yes	Yes	No	Yes	Yes	No	No	No
4	No	Yes	Yes	Yes	No	No	No	Yes	No	Yes	No	Yes	Yes	No
5	Yes	No	No	No	No	Yes	No	No	No	No	No	No	No	No
15	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
16	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No
17	No	Yes	Yes	No	Yes	No	No	No	No	No	No	Yes	Yes	No
19	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	No	No	Yes	No
30	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	No	No	Yes	No
41	Yes	Yes	No	No	Yes	Yes	No	No	Yes	No	No	No	No	No
42	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	Yes	No
43	Yes	No	Yes	Yes	Yes	Yes	No	No	Yes	No	No	No	No	Yes
44	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	No	No	Yes	No	No
45	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes
46	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	No	No	No	Yes
47	Yes	Yes	Yes	No	Yes	No	No	Yes	No	No	Yes	No	Yes	Yes
48	Yes	No	Yes	Yes	Yes	No	No	No	Yes	Yes	No	Yes	No	No
49	Yes	Yes	No	Yes	No	No	No	Yes	No	No	No	No	No	No
50	Yes	Yes	Yes	Yes	No	No	No	No	Yes	No	No	No	No	No
51	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	No	No	No	No
52	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
53	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	No	No	Yes
54	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
55	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes
56	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	No	No	Yes	No
57	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No
58	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No	No	No	No	Yes	No
59	Yes	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No
60	Yes	Yes	No	Yes	Yes	No	No	Yes	No	No	Yes	Yes	No	Yes
61	Yes	No	No	No	Yes	No	Yes	No	Yes	No	Yes	No	No	No
62	Yes	No	No	No	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes
63	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	No	No	No	No
64	No	Yes	No	No	No	No	Yes	Yes	No	Yes	No	No	No	No
65	No	Yes	Yes	No	No	No	No	Yes	No	No	No	Yes	No	No
66	No	Yes	Yes	No	No	No	No	No	No	No	No	Yes	No	No
67	No	No	No	No	No	No	Yes	No	Yes	Yes	No	No	No	Yes
68	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No	No	Yes
69	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No
70	No	No	No	No	No	No	No	No	No	No	Yes	Yes	No	No

data sets as the high employees skills ensure the smooth and timely service delivery. Therefore, the client and vendor must consider this factor before taking the outsourcing decision. The factor 'legal requirements' is another CSF of both IT outsourcing and maintenance offshoring which gained 57% in IT outsourcing and 52% in maintenance offshoring. It is the fourth highest cited factor in IT outsourcing whereas in maintenance offshoring, its value is similar to the remaining two factors. The second last CSF of both data sets is infrastructure with values of 55% and 52%. It shows that infrastructure affects the service delivery both in outsourcing and offshoring. Language barrier is the last CSF with the same impact, i.e. 52% on both IT outsourcing and on the sourcing decisions of software maintenance.

V. STUDY LIMITATION
This section presents various threats towards our study. We have chosen a total of 101 articles for performing the current study. Literature review shows the availability of a huge number of publications regarding IT outsourcing and software maintenance. It is not possible to include all of them so some of the related publications are likely to be missing, as well as the influencing factors of IT outsourcing and offshore outsourcing software maintenance.

Another challenging task is to address the threat, regarding the inclusion of specific factors in the selected papers. As, the primary studies might have a tendency towards some specific type of factors as well as the authors have not mentioned the basic reason for the selection of these factors.

In the current study, the influencing factors were extracted from 101 selected papers. The selection of primary studies was performed on the basis of study defined inclusion and exclusion criteria. The selected primary studies show that the majority of authors are from academia. So, the authors of these papers might not have the experience and expertise of the outsourcing industries and the existing trend of GSD. In order to validate the identified factors of the SLR, an empirical study will be conducted in outsourcing industry.

VI. CONCLUSION AND FUTURE WORK
The current study provided a comprehensive overview of the three aspects of outsourcing namely: benefits of IT outsourcing, influencing factors of IT outsourcing and influencing

TABLE 13. Reference traceability table for influencing factors of software maintenance offshoring.

References	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15
	Influencing factors of software offshore outsourcing
4	No	Yes	Yes	No	No	No	No	No	No	Yes	Yes	No	No	No	No
7	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
10	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No	No	No	No	No
12	Yes	Yes	Yes	No	No	Yes	Yes	No	No	Yes	No	No	No	No	No
15	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes
17	No	Yes	Yes	No	Yes	No	No	No	No	No	Yes	Yes	No	No	No
41	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	No	No	No	No	No	No
42	Yes	Yes	No	No	Yes	No	Yes	Yes	No	No	No	Yes	No	No	No
44	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	Yes	No	No	No
46	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	No	No	Yes	No	No
48	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
49	Yes	Yes	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No
52	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
53	No	Yes	No	Yes	Yes	No	No	Yes	No	No	Yes	No	No	No	No
54	Yes	No	No	Yes	No	Yes	No	Yes	No	Yes	No	No	No	No	Yes
56	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	No	Yes	No	No	No
57	Yes	No	Yes	Yes	Yes	No	Yes	Yes	No	No	No	No	No	No	No
59	Yes	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No
62	Yes	Yes	No	No	No	Yes	No	No	No	No	Yes	Yes	Yes	Yes	Yes
64	No	Yes	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No
66	No	Yes	Yes	No	No	No	No	Yes	No	No	No	No	No	No	No
67	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	No	Yes	No	No
71	Yes	Yes	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No
72	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	No	Yes	No	No	No
73	Yes	Yes	Yes	No	No	No	Yes	No	No	Yes	Yes	Yes	No	Yes	No
74	Yes	No	No	No	Yes	No	No	Yes	Yes	No	No	No	Yes	No	No
75	Yes	No	Yes	Yes	No	Yes	No	No	Yes	Yes	No	No	No	No	No
76	Yes	Yes	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	No
77	Yes	No	No	No	No	No	No	No	No	Yes	No	Yes	No	No	No
78	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No
79	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No
80	No	Yes	Yes	No	Yes	No	No	No	No	Yes	Yes	Yes	No	No	No
81	No	Yes	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No
82	No	Yes	No	No	No	Yes	No	No	No	No	Yes	No	Yes	No	No
83	No	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	No
84	No	No	Yes	No	No	No	Yes	Yes	No	No	No	No	No	Yes	No
85	No	No	No	Yes	No	No	No	Yes	No	No	No	Yes	Yes	No	No
86	No	No	No	No	No	No	Yes	No	Yes	Yes	No	No	Yes	No	Yes

factors of software maintenance offshoring. The study presented, perceived benefits (11) of IT outsourcing, influencing factors (14) of IT outsourcing and a list of 15 important parameters of software maintenance offshoring. Amongst the identified factors of IT outsourcing and application maintenance offshore outsourcing, only 6 factors were tagged as critical for both the data sets, namely: cultural diversity, cost, employees' skills, legal requirements, infrastructure and language barrier. The result shows that cultural diversity has the highest scores in IT outsourcing and maintenance offshoring (65% and 73%) respectively. Cost is the second highest CSF in both data sets, with the values of 65% and 63%. Likewise, the third highest CSF is the employees' skills that received 57% and 63% of preferences for IT outsourcing and maintenance offshoring. The factor 'legal requirements' is another CSF which gained 57% in IT outsourcing and 52% in maintenance offshoring. The second last CSF of both data sets is infrastructure with values of 55% and 52%. The last CSF is the language barrier (52%) that shows the same level of importance for the sourcing decision of IT and application maintenance offshoring. The result indicates the significance of the identified CSFs for the global outsourcing decisions of both IT outsourcing and software maintenance offshoring. The IT experts and decision makers should consider these CSFs prior to sourcing decisions. The clients and vendors need to take into account these critical success factors to ensure the smoothly and timely, service delivery. Therefore, the result of the current research work will help the IT experts and decision makers in making appropriate outsourcing decisions. Likewise, the findings of the study could be helpful for the students, scholars and outsourcing decision makers. Moreover, the outcome of this study will be used as a part of our proposed research work as follows:

• The identified factors will be validated through empirical study in the outsourcing industry.

• The identified list of factors will be updated through empirical study.

• Consequently, a project assessment model will be developed for outsourcing decisions based on the literature review and empirical study.

• The sourcing framework will be followed by the development of multi criteria decision support system for software maintenance.

APPENDICES

Appendix (A): Table 9. References traceability table for the extraction of perceived benefits of IT outsourcing and influencing factors of IT and software maintenance.

Appendix (B): Table 10. Reference traceability table for perceived benefits of IT outsourcing

Appendix (C): Table 11. Reference traceability table for influencing factor of IT outsourcing

Appendix (D): Table 12. Reference traceability table for influencing factors of software maintenance offshoring

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