Engineering

OUTSOURCING CONTRACTS: A SYSTEMATIC REVIEW

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Abstract: This paper presents the application of a systematic review protocol for Software Engineering. This protocol is used as a formal model by applying systematic review of outsourcing contracts. The objective is to search for papers related to outsourcing contracts in the software acquisition process. Furthermore, the systematic review is focused in order to identify initiatives and reports of outsourcing contract proposals for the software acquisition. Results obtained show that most of the studies that tried to define a model for outsourcing did not exactly develop a fixed model to be used in the IT area and that there is a need for more in-depth studies.

Keywords: Outsourcing Contracts, Systematic Review.

ACM Classification Keywords: D.2.9 Software Engineering – Management, software process models

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1. Introduction

In the past few years outsourcing has gained a lot of importance in the market and, for example, the IT services outsourcing market is still growing every year [6, 7]. Outsourcing as a concept gained common acceptance in the 1980s and is still used today to describe "a contractual relationship with a specialized outside service provider for work traditionally done in-house" [1].

Trend analysts such as Morgan & Chambers [2] and IDC [3] predict annual growth figures of approximately 10%. The Gartner Group [4] has estimated that the worldwide IT outsourcing market will grow €162,1 billion in 2008. Forrester [4] forecasts that European enterprises will spend over €128 billion on computer outsourcing in 2008. This growth has also been emerged in China [4, 5]. According to international analysis, China's IT outsourcing services market size reached €0,28 billion in 2005, increasing about 16% over the previous year. Finally this analysis predicts that the total IT outsourcing services market will reach €0,68 billion by 2009.

According to a recent study [8], 20 to 25 percent of large information technology (IT) acquisition projects fail within two years and 50 percent fail within five years. Mismanagement, the inability to articulate customer needs, poor requirements definition, inadequate supplier selection and contracting processes, insufficient technology selection procedures, and uncontrolled requirements changes are factors that contribute to project failure. Responsibility is shared by both the supplier and the acquirer.

The majority of project failures could be avoided if the acquirer learns how to properly prepare for, engage with, and manage suppliers [8]. The case of Southern Pacific Transportation Co. described by [9] is an example. After

negotiating a deal with Integrated Systems Solutions Corp. for all of its IT functions, including service, the outsourcer came perilously close to derailment after portions of the contract were not met.

Between the works that deal specifically with Outsourcing Contracts, it is possible to mention the works of [2, 3, 10, 11]. The work of [10], relied on transaction cost theory to develop a series of propositions on the relationship between the characteristics of the transaction - asset specificity, number of suppliers, measurement problems, uncertainty, and permanent character of the contract - and the level of contract completeness, using a survey of 200 firms to test the propositions. Using an approach that includes desk research involving six European IT outsourcing companies, including one that was worldwide in scope, the work of [11] presented a series of propositions related to the management of IT outsourcing contracts.

A really important study was conducted by [2], which presented a practical and systematic overview of some key IT outsourcing contractual issues, exploring and highlighting management implications where appropriate. Issues such as service level transfer of assets, staffing, pricing and payment, warranty and liability, dispute resolution mechanism, termination, intellectual property matters, and information security were discussed. Practical advice on pre-contractual negotiation and post contractual management was also given.

This work shows the results of a systematic review of outsourcing contracts in the areas of information technology and information systems.

2. Systematic Review of Outsourcing Contracts

Before the twentieth century there were not approaches to integrate research results. In 1904, Pearson calculated the average of results of correlation between the typhoid fever inoculation and mortality. Then systematic review began to formalize and at the end of the 80's systematic review achieves legitimacy as a field of research [10, 12].

The writer of a systematic review uses an explicit and rigorous method to identify, critically appraise, and then synthesize relevant studies in the published research, using quantitative methods to assess research from different studies [13]. Benefits of the systematic review include: 1) Reduce the amount of literature the researcher must read, 2) Assess consistency across studies, 3) Widen the generalizability of individual studies across participants and settings.

The search for issues related to outsourcing contracts was based on the work of [12] that proposed a protocol for systematic review, on the guidelines proposed by [14] and on the forms of extracting information from software engineering papers, developed by [15] and other similar systematic reviews.

The systematic review developed during this work followed the protocol established by [12]. Defined assessment objectives, reference sources, both exclusion and inclusion criteria to be applied in the study, data extraction method, data analysis of primary studies are some of the topics contained in this protocol.

3. Prototype Development

Next, the prototype development used during the systematic review in Outsourcing Contract is presented.

3.1 Question Formulation, Focus and Quality and Amplitude

This section aims at defining the syntax of the research question (the context in which the review is applied and the question the study must answer) and its semantics specificity (or question range) described by the remaining items of this section – intervention, control, effect, outcome measure, population and application [12]. Next, each of them is described for Outsourcing Contracts.

- Problem: Outsourcing has gained a lot of importance in the market during the past few years. The implementation of a good contract is really important for a successful outsourcing, but until now a well-defined model to create an outsourcing contract is not defined.
- Question: Which are the initiatives or proposals developed for the Outsourcing Contracts?
- Intervention: The actual development of the outsourcing contracts.
- Effect: Initiatives and proposals related to the Outsourcing Contracts.
- Outcome Measure: Number of identified proposals.
- Population: Publications related to Outsourcing Contracts.
- Application: Any company that has a client-vendor/buyer-seller relationship. Researchers working at Outsourcing Contracts.
- Experimental Design: None experimental design will be performed.

3.2 Sources Selection

The objective of this section is to select the sources where searches for primary studies will be executed [12]. To perform the selection the author of the systematic review protocol proposes to address the following issues:

3.2.1 Sources Selection Criteria Definition and Study Languages

- Use search mechanisms with keywords and sites suggested by experts.
- Papers recommended by other experts.
- Papers available on the website.
- English.

3.2.2 Sources Identification

- Sources search methods: The identification of sources has been based on the criterion of experts in our research area. This source include journals as: European Journal of Operational Research, Information and Software Technology, Software: Practice and Experience, Software Process: Improvement and Practice, IEEE Software, Software Technology and Engineering Practice, Computer and research workshops and technical reports of Software Engineering Institute – SEI, among others.
- Search string: Keywords from the word set defined in the question formulation were extracted. Combining these keywords with the logical operators “AND” and “OR”, two search strings were obtained (see Table 1). Also analyzing the references of the first papers found, a third search string was found. These search strings have been adapted for each web browser of the sources.
- Source list: These sources have been selected taking into consideration the sources search method defined. In Table 2 the source list is presented.

Table 1 - Search strings

	Search Strings
1	outsourcing and contract and (clauses or structures or characteristics)
2	outsourcing and contract
3	(outsourcing or buyer-seller or client-vendor) and (relationship or partnership)

Table 2: Sources List

#	Source
1	Science@Direct
2	Springer Link
3	Computer Database – GALE
4	ISI Web of Knowledge
5	IEEE Computer Science Digital Library
6	ACM Digital Library

3.2.3 Sources Selection after Evaluation

It was evaluated if sources fit all defined criteria. After applying the search string to all sources, it was found that some items were common in some sources. Most of the papers were at IEEE Computer Science Digital Library and some of these papers were found also at Science@Direct, Springer Link and principally at ACM Digital Library. Repetitions were also found between Science@Direct, Springer Link and ISI Web of Knowledge.

3.3 Studies Selection

In this systematic review an iterative and incremental procedure is used for studies selection: a) Iterative, to group all activities that could be repeated during the procedure, and b) Incremental, because the studies are approached and recorded one by one until achieving the systematic review results [16]. This iterative and incremental procedure is used due to its functionality in other systematic reviews. Once the sources are defined, it is necessary to describe the process and the criteria for studies selection and evaluation, which will be explained during this section.

3.3.1 Studies Definition

This item defines the way how studies were selected [12].

- Studies Inclusion and Exclusion Criteria Definition: It presents criteria by which studies will be evaluated to decide if they must be selected or not in the context of the systematic review [12]. Table 3 shows the studies Inclusion (IC) and Exclusion Criteria (EC).

Table 3: Studies Inclusion (IC) and Exclusion (EC) Criteria

#	Criteria
IC1	Include papers whose title is related to Outsourcing Contract
IC2	Include papers that contain keywords that match with those defined in the search string
IC3	Include papers whose abstract is related to the topic considered
IC4	Include papers after partial or total reading
EC1	Exclude those papers that do not match with the previous inclusion criteria
EC2	Exclude all duplicated papers (those selected in various search engines)

- Studies Types Definition: Initially all studies related to outsourcing contract will be taken into account. However, the greatest interest will focus on studies that show results on how to define a model or how to structure the clauses or characteristics of outsourcing contracts.
- Procedures for studies selection: With the regard to the selection criteria, the title was initially the main criterion; nevertheless, in some cases, it did not provide enough information, thereby reading the summary of each of them was necessary and in some cases a review of the full text was required. The flow diagram of Figure 1 illustrates this procedure.

The flow diagram shows the performed process to select primary studies and to apply defined criteria in the previous section. This diagram shows in dotted lines the activities blocks for primary studies selection and information extraction. Information extraction will be presented later.

Before executing the systematic review, it is necessary to evaluate the planned review. If the obtained results are not suitable, the protocol must be reviewed and a new version must be created. After evaluating this planning, systematic review execution can be started [12].

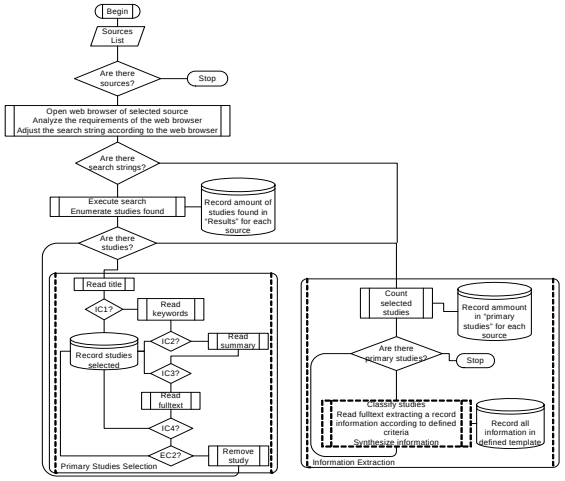

Figure 1 – Flow Diagram of the systematic review

3.3.2 Selection Execution

Next, the register of the primary studies selection process, the obtained report studies and the results of their evaluation are presented [12].

- Initial Studies Selection: At first a search execution was conducted to verify the parameters used by each engine and adapt the search string to them. Table 4 shows in the column "Found" the obtained values.
- Studies Quality Evaluation: To determine the quality of the study, the author of this paper, applying IC and ED, obtained the relevant and primary studies (see Table 4). Relevant are the studies that contain 4 of the selection criteria and primary studies are the ones that contain all the selection criteria. Table 4 shows the distribution of found studies in each of the sources search, using established search strings and applying the defined inclusion and exclusion criteria through this systematic review protocol development.

Table 4: Results derived from each source search

Source	Search Date	Found	Repeated	Relevant	Primary	%
Science@Direct	9-12-15/12/2008	111	3	5	2	6.5
Springer Link	9-12-15/12/2008	159	0	6	6	19.4
Computer Database GALE	9-12-15/12/2008	70	1	5	5	12.9
ISI Web of Knowledge	9-12-15/12/2008	166	3	4	3	9.7
IEEE Explore	9-12-15/12/2008	218	9	14	14	45.2
ACM Portal	9-12-15/12/2008	126	8	10	2	6.5
TOTAL:		850	24	44	32	100

3.4 Information Extraction

This section begins once primary studies are selected. Then, in this section, extraction criteria and result are described.

Table 5: Information inclusion and exclusion criteria

#	Criteria
IC1inf	Collect information about the organization's trend related to outsourcing contract.
IC2inf	Classify processes followed by companies for outsourcing contract.
IC3inf	Identify proposed methodologies, methods and procedures in studies for Outsourcing Contract Development and/or Management.
EC1inf	Exclude the information that is not related to the inclusion criteria defined above.

3.4.1 Data Extraction Forms

To analyze the information from the selected studies, first they were divided in folders each of them related to the search source where they were found. The selected studies then where put together in a final folder to eliminate the repetition. The relevant information of each study was highlighted and then extracted to a separated file, containing the name of the study and all related useful information.

3.4.2 Extraction Execution

- Objective Results Extraction: A complete and detailed reading from these studies allowed us to organize and classify them for a later analysis. With an unbiased evaluation of the information, identified and classified studies record were generated in a structured table containing the following rows Consecutive Study (sequential paper number), Study Methodology (remarks of main ideas concerned with the methodology), and Study Outcome (data and information of the conclusions presented in each study).
- Subjective Results Extraction: The following rows where added to the previous table: Data about Authors (full names and available contact information in the studies), Additional Notes (a specific field to store general information related to the subject covered in the study).

Following this methodology, the information extracted was organized following the fields: number consecutive, paper title, journal/conference, authors, topic, type of study, date, country, goals(analyze, for the purpose of, with respect to, from the point of view of), method (name, type, possible values, data collection procedure), implementation (company, category, size), results of study and other issues.

4. Results Summary

Now, with the information extracted from the primary studies on hand, it is necessary to do some analysis of them. In this section, these informations were analyzed and provided useful information as it will be shown.

4.1 Studies Trends

The first analysis done was related to organization's trends respect to outsourcing contract, where any study referring to outsourcing contract development and/or management were classified. Figure 2 shows the graph related to this analysis.

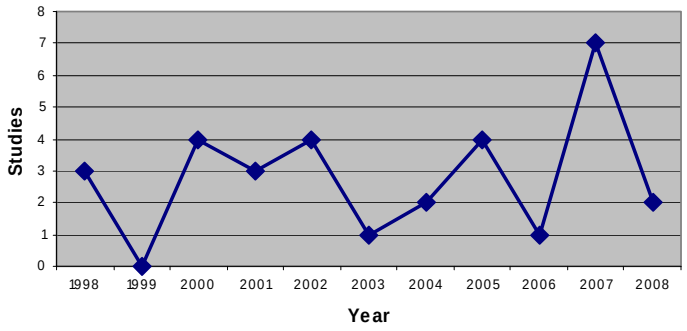

Figure 2 – Studies trends

Taking a look at this graph, it is not possible to see a specific and defined trend during the years from where the primary studies were selected. The graphs do not follow a linear trend which could mean an increasing or decreasing interest to the topic. In the year of 2007 is possible to see that the number of studies was really high but then in 2008, this number decreases again.

4.2 Studies Classification and Classification of studies by country

The primary studies were selected following the methodology defined during the protocol definition and they could be classified in some areas of interest. The classification showed 6 different areas: 1) Related to Information Technology, 2) Related to Information Systems, 3) Related to Marketing, 4) Related to Enterprise Resource Planning, 5) Related to Network Security and, 6) Related to Transports.

The explanation for the inclusion of 2 areas (Marketing and Transports) is that the studies showed an interesting discussing of how to develop (definition of structure and characteristics) and maintain a contract during the buyer-seller relationship. Figure 3 shows this classification:

Figure 3 shows that 69% of the studies were related to Information Technology and 16% to Information Systems. The combination of both (85%) showed that the systematic review was well conducted since most of the studies were related to the area that we are looking for. It is also important to look at the 6% related to Marketing (3%) and Transports (3%) which does not have a strong influence in the final classification but shows interest results for the study of outsourcing contracts.

A study showing the source origin of the papers was done which shows that searches related to Outsourcing Contracts are largely been conducted in USA, with 49%. The second country is China with 13% which could be related to the economical development by which this country is passing through. However, 20% of studies do not show the source and the others are divided by Germany, Ireland, Finland, Netherlands and Brazil. Figure 4 shows these results.

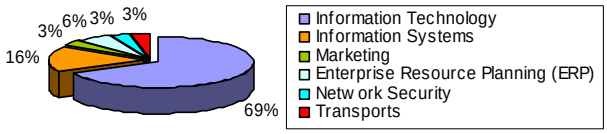

Figure 3 – Studies Classification

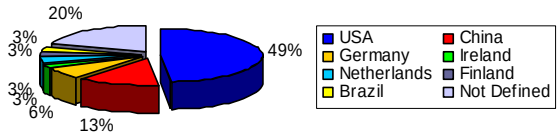

Figure 4 – Studies classification by country

4.3 Classification of studies by size of companies and Classification of studies by model

The large amount (80%) of the studies did not mention the company where the study was carried on, as shown in Figure 5. However, the other 20% of the studies that presented this information were related to large companies.

Most of the studies (40%) did not indicate the model followed during the research, where sometimes it is acceptable since the study do not need to show it or due to lack of information by the authors. The most used model was the Transaction Cost with 13%, followed by the Relational Contract or Exchange Theory (10%) and by the Incomplete Contract Theory, Principal Agent Theory and Workflow Modeling, all the three with 6%. All these information can be seen on Figure 6.

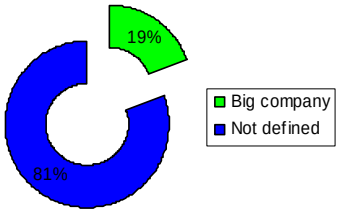

Figure 5 – Studies classification by size of companies

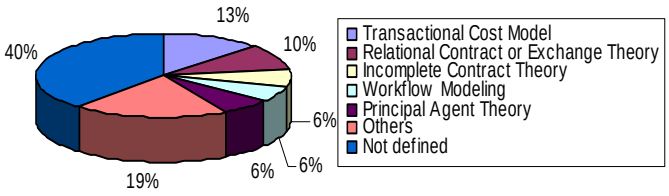

Figure 6 – Studies classification by model

4.4 Proposals of the studies

Most of the studies analyzed are related to the IT or IS area, which are exactly the topics that this systematic review was proposed to find. They use some general ideas of outsourcing and also from development of contracts. Two studies were related to Marketing and Transports, as stated on section 2.3.2 and give more information about the development and management of contracts in outsourcing, not relating exactly to the IT or IS area. Figure 7 shows the results.

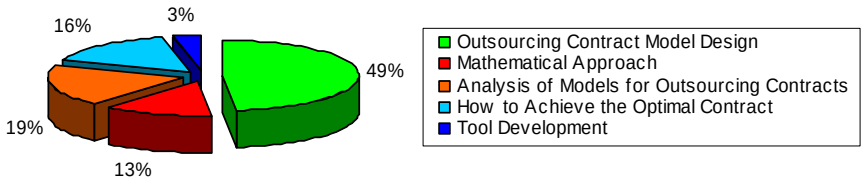

Figure 7 – Proposals of the studies

Most of the proposals (49%) are related to the design of a specific model for outsourcing contract, showing how to structure the contract and which are the most important characteristics that a contract must contain. Some proposals (19%) analyzed some models related to outsourcing, like Transaction Cost Model, Incomplete Contract Theory and Relational Contract or Exchange Theory, 13% focus on a mathematical approach of how to select the best contract for a company. These approaches create some formulas and constraints using the Transaction Cost Model. Some studies (16%) focuses on how to achieve the optimal contract analyzing, for example, the IT structure of the company. One study aims to develop tools based on discrete-event simulation to aid outsourcing companies when costing contracts.

5. Conclusions

This systematic review related to the Outsourcing Contracts was carried out using the protocol proposed by [12]. This protocol has 5 main characteristics related to the systematic review process, where a final statistical analysis of the primary studies is conducted to achieve important results and also to check the quality of selected papers.

Systematic review takes more time to be done and also more effort than the normal literature review, but the results achieved are more consistent, since they are based on a well defined prototype that detail all the methods for inclusion and exclusion of studies and important informations. The results presented here focus on the initiatives and proposals related to outsourcing contracts where it was possible to see that there is not an specific trend related to this area, besides a big amount of work was done in 2007.

The large percentage (85%) of the studies analyzed was related to IT and IS, which are the main topics that this systematic review was proposed to analyze. USA is the country was most studies were done followed not so close by China, 49% to 13%. Regarding the models used and the proposals defined by the studies, 40% did not mentioned the models used and the most used was the Transaction Cost Model (13%) and 49% designed a model for outsourcing contracts.

These results indicate a lack of studies in this area, since just 31 were found and not all of them are specific related to the Outsourcing Contracts. Most of the 49% studies that tried to define a model for outsourcing did not exactly develop a fixed model to be used in the IT area.

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