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# A Comparative Analysis of Offshored and Onshored Software Development Projects

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## Abstract

*This empirical study discusses various aspects of global outsourcing (or offshoring) of IS projects. Using data from 57 paired onshoring and offshoring software projects, matched with respect to project size, beginning times and data quality and conducted in 17 nations over the period from 1991-2003, the research finds that offshored projects require more time to complete than do similar onshored projects. In comparing the technical differences between the matched projects, we found that offshored projects tend to be new client-server, Management Information System (versus TPS) applications, developed on Mid-range computers, using standard/traditional programming languages such as C/C++ and tools. Older languages such as COBOL do not get offshored that much.*

**Keywords:** Software development projects, Onshore, Offshore, Matched pair analysis

## Introduction

Outsourcing can be defined as the use of external agents to perform one or more organizational activities (McFarlan et al., 1995). Information System (IS) outsourcing in the U.S. dates back to the 1960s, the first well publicized example being the awarding of contracts by the U.S. government for computerizing Medicare records to Electronic Data Systems (EDS) in 1962 (Wikipedia, 2007). Two reasons are generally given for the use and expansion of IS outsourcing (Hirschheim, 2004). First, managers have long questioned the value generated by IS for an organization, a debate which still continues (Earl, 1996; Willcocks et al., 1996; Ketler et al., 1999). Consequently, managers thought it prudent to shift IS functions to external organizations, mainly to reduce costs. Second, in order to maintain, or gain, a competitive advantage, firms considered it essential to focus on their core competencies and outsource all non-core business functions, including the IS function.

Initially, outsourcing involved the relocation of business processes to a third party in the same nation as the outsourcer, or Onshoring (ON), taking advantage of the vendor's expertise and economies of scale. Over time, however,

it became clear that maximization of cost savings would require Offshoring<sup>1</sup> (OFF), or the relocation of business processes from one country to another country where wages are significantly lower and skilled labor is easier to find (Carmel and Tjia, 2005). The trend toward OFF also corresponds to, and was promoted by, refinement of the Internet and advances in telecommunication technologies, as software can be electronically transferred through secured channels, at each phase of development, for examination and comment by the outsourcer. Additional reasons cited for OFF include gains in efficiency, productivity, and quality.

Software development, together with technical support, web site design, and information technology (IT) infrastructure development, is a \$90 billion industry (BusinessWeek, 2006a). In 2005 alone, IT and business process outsourcing amounted to \$34 billion and is expected to double in 2007. It has been reported that more than 80% of European companies engaging in OFF are satisfied with the results, and that the cost savings realized have generally ranged between 20% and 40% (UNCTAD, 2004).

OFF has nonetheless generated a great deal of controversy in the popular press, as well as in the academic community, primarily because of the subsequent loss of jobs in the outsourcing nation (Dobbs, 2004). However, other performance aspects of OFF have received little or no attention. Among these are the time taken to complete the project, the quality of the project (number of errors), and the number of man-hours needed to complete the project.

The present empirical study seeks to compare and contrast the performance of OFF with ON across the dimensions listed above. We examine 57 paired ON and OFF software projects, matched with respect to project size, beginning times and data quality, conducted in 17 nations over the period from 1991-2003. For projects where the completion time differed, we further examined some how selected technical factors varied.

Some of the unique features of the study include:

- Analysis of a large number of projects (228 total)
- Projects from a multiple nations (17 in total)
- Projects conducted over an extended period of time (1991-2003), but matched according to same beginning time.

This information can help researchers, policy makers and organizational decision makers better understand the relative advantages and shortcomings of ON versus OFF. Additional analysis of differences completion times between ON and OFF projects can provide insight for managers with respect to which types of systems and technical factor are best suited for ON or OFF projects

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<sup>1</sup> We do not differentiate between offshoring and nearshoring, the relocation of business processes to (typically) lower cost foreign locations, but in close geographical proximity

In the following section, we first discuss some of the background issues involved and theories developed to explain them. We then present our conceptual models and research questions, followed by a description of the methodology and data, our findings, discussion, and conclusion.

## Background

A firm's desire to reduce the cost of organizational IS is not a new phenomenon. Lacity and Hirschheim (1993) and Saunders et al. (1997) note that firms have been seeking to gain better control over their IS resources and budgets for many years, and in many cases believed that outsourcing was a viable solution. However, over time, many firms found that they were less excited about outsourcing after having dealt with the realities of outsourcing (Saunders et al., 1997; Udo, 1999). Udo (1999) compared the effectiveness of outsourced and in-house computing based on their potential benefits and drawbacks by surveying 97 US firms. His findings indicate that in-house computing appears to be a better approach than outsourcing in eight out of the ten benefits considered.

Resource theory perspective can be used to explain OFF. Because some resources are more readily available in different parts of the world, OFF might be more cheaply and effectively developed in those countries. Certain resources and skills could also be firm-specific, rare and difficult to imitate (Barney, 1991). OFF may need several special resources that may be available to specific sites at another part of the world: low cost of software production, a requisite number of skilled developers and quality of software produced in time, to mention a few (Smith et al., 1996). For example, India has a large reserve of inexpensive English-speaking highly educated group of computer professionals.

OFF software contracts usually provide benefits after a long period of time. The OFF vendors should be trained appropriately so that they understand the organizational requirements of a firm, which may a lengthy process. According to a recent study, OFF firms should be prepared to invest in time and effort (BusinessWeek, 2006a). It has been suggested that Internet Service Provider Outsourcing (ISPOs) may require more time to finish and efforts in the early and the later stages of a project, where communication plays a critical a role (Efendioglu et al., 2005). Efendioglu et al. (2005) found that nearly 95% survey respondents expected some delays in off-shored deliverables. They were willing to tolerate an average project delay of two weeks with 79% willing to tolerate one to two weeks delay and 21% a three to eight weeks delay. Because the OFF cost is substantially low than in-house projects, firms can benefit economically despite delays. The quality of OFF deliverables is also extremely important to a firm (Krishnan et al, 2000). However, managers have often expressed doubts about the quality of such products (BusinessWeek, 2006a), and thus further investigation is warranted.

## Conceptual models and research questions

Our first set of research questions concern the differences between ON and OFF software projects. More specifically, we consider the differences between similar software projects, one developed by ON and one developed by OFF. Conceptually, this situation is modeled in figure 1.

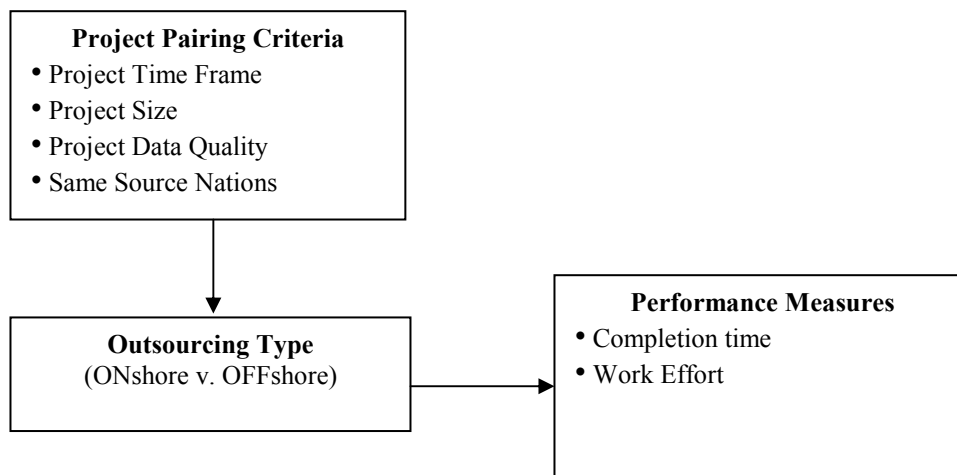


Figure 1.

### Model 1: Differences between paired ON and OFF projects

Comparable (projects of the same size and data quality) ON and OFF software projects (the pairing process is described in the methodology section) were contrasted with respect to their relative performance using three measures. Since performance measurement can be defined as the process of quantifying the efficiency and effectiveness of action (Neely et al., 2005), two of the measures chosen, completion times and work effort, both reflect project efficiency. The performance measures are summarized in Table 1.

Table 1.  
The performance variables

Variable	Meaning
Elapsed Time	The time taken to finish a project (in months)
Normalized Work Effort	For projects covering less than a full development life-cycle, this value is an estimate of the full development life-cycle effort. For projects covering the full development life-cycle, and projects where development life-cycle coverage is not known, this value is the same as summary work effort. <sup>1</sup>

<sup>1</sup> Whichever measures were applied were applied to both of the matched pairs.

Thus, our first set of research questions are:

- RQ1. Does software project elapsed time differ between ON and OFF projects?
- RQ2. Does software project work effort differ between ON and OFF projects?

Our final research questions concern how ON and OFF projects vary technically. The ISBSG (2004) maintains data on a number factor groups, far too many to be included in any one study (See Appendix I for Available ISBSG Metrics). Since this is an exploratory study, only five groups of factors were examined to see how they differ between ON and OFF projects: Development Type (New, Enhancement, and Re-development), Application Type (Transaction Processing vs. Management Information), Architecture (stand alone vs. client server), Development Platform (PC, Mid Range and Mainframe, and Language Type (4GL, 3GL, APG, C/C++, and COBOL). Table 2 describes the factors selected.

**Table 2.**  
**Comparison factors descriptions<sup>2,3,4</sup>**

<b>Factor</b>	<b>Description</b>
<b>Development Type</b>	<p><b>New Development:</b> Full analysis of the application area is performed, followed by the complete development life cycle, (planning/ feasibility, analysis, design, construction and implementation). Examples are:</p> <ol style="list-style-type: none"> <li>1. A project that delivers new function to the business or client. The project addresses an area of business, (or provides a new utility), which has not been addressed before.</li> <li>2. Total replacement of an existing system with inclusion of new functionality.</li> </ol> <p><b>Enhancement:</b> Changes made to an existing application where new functionality has been added, or existing functionality has been changed or deleted. This would include adding a module to an existing application, irrespective of whether any of the existing functionality is changed or deleted.</p> <p><b>Re-development:</b> The re-development of an existing application. The functional requirements of the application are known and will require minimum or no change. Re-development may involve a change to either the hardware or software platform. Automated tools may be used to generate the application. This includes a project to re-structure or re-engineer an application to improve efficiency on the same hardware or software platform. For re-development, normally only technical analysis is required.</p>
<b>Application Type</b>	<p><b>Transaction Processing System (TPS):</b> These systems can be batch or on-line and process business transactions in a logical sequence within a business area. The system consists of a set of inputs to which the transaction/production system adds value and outputs customer or corporate requirements. Examples include: payroll, order entry/processing, general ledger, inventory and case management.</p> <p><b>Management Information System (MIS):</b> Provides users with predefined management reports via a reporting system where the user selects the criteria from a limited selection and can usually store the criteria. The report information assists with performance management of a department or business.</p>
<b>Architecture</b>	A derived attribute for the project to indicate if the application is Stand alone, Multi-tier, Client server, or Multi-tier with web public interface.
<b>Development Platform<sup>5</sup></b>	Defines the primary software development platform, (as determined by the operating system used). Each project is classified as: PC, Mid Range, Main Frame or Multi platform
<b>Language Type</b>	Defines the language type used for the project: e.g. 3GL, 4GL, Application Generator etc.

Our final research questions are:

<sup>2</sup> The phases used correspond to ISBSG nomenclature (2006)

<sup>3</sup> The meanings are taken from ISBSG (2006)

<sup>4</sup> Only selected categories were considered

<sup>5</sup> For the sake of brevity, only Client-Server and Stand-Alone projects were considered

- RQ3. How do ON and OFF software projects differ with respect to project Development Type?
- RQ4. How do ON and OFF software projects differ with respect to application types?
- RQ5. How do ON and OFF software projects differ with respect to system architecture?
- RQ6. How do ON and OFF software projects differ with respect to development platform?
- RQ7. How do ON and OFF software projects differ with respect to the type of language used?

## **Data and methodology**

### **Data sources**

Release 9 of the Data Repository of the International Software Benchmarking Standard Group (ISBSG) contains 3,024 projects in the Repository, although data are not necessarily available for all reporting areas (ISBSG, 2004). The data in the project repository comes from twenty countries, with 70% of the projects being less than six years old. A broad range of project types from many industries and many business areas are included. The data submitted are voluntary and have been validated in previous studies (Jeffrey, 2000; Lokan, 2000). The data has been used in previous academic studies (Heales, 2004) and in many industrial settings for estimation and benchmarking purposes.

We consider offshore projects (OFF) as those that had different sourcing and implementing nations. Onshore projects (ON), on the other hand, consisted of projects having same source and destination nations. We took special care to eliminate outsourced projects from the ON subset. Also it can be mentioned that the within the same firm one department can send its projects to another department located in a different nation. For our purposes, this is offshoring as the project benefits from all advantages of offshoring (for example, low cost).

### **Project pairing criteria**

Pairing similar ON and OFF projects was performed by matching projects from each of the outsourcing subsets (ON and OFF) on four criteria. These criteria were selected because they illustrate the basic differences between software projects.

### **Project time period**

Matching projects that were began at approximately the same time (i.e., within one year of each other) may have some bearing on the results. It may be that over the years, experience with outsourcing, both from the outsourcer and outsourcee perspective, has changed, along with changes in organizational demands and available technologies. To avoid any concerns, we consequently used time frame as a basis of comparison.

### **Project size**

Determining quantifiably measures of project size, and by extension, complexity, has long been problematic. Some of the software sizing methods that have previously been proposed includes the number of source code lines and



various measures based on technical characteristics of the software (ISBSG, 2007). These approaches were limited because they could not be:

- applied early in the software development process,
  - applied uniformly throughout the software's life time,
  - easily interpreted in business terms, or
  - meaningfully understood by users of the software (ISBSG, 2007)
- Function points can be measured in many ways, including the IFPUG (the International Function Point Users'

Group), MARK II, NESMA, COSMIC-FFP, and others (full descriptions of each methodology are not viewed as necessary for the purposes of this paper). Of the aforementioned methods, IFPUG is the most common, and the one selected for this paper.

### **Project data quality**

If multiple project size matches were found, we next matched projects based on similar data quality. Data quality, defined as the understanding and availability of the rules by which the data elements are interrelated and validated, represents a substantial project risk (Agosta, 2001). Data quality problems can render data completely or largely unfit for use (Strong et al., 1997).

When projects are submitted for inclusion in the International Software Benchmarking Standards Group (ISBSG) repository, they undergo a series of quality checks for completeness and integrity. This field contains an ISBSG rating code of A, B, C or D applied to the project data quality by the ISBSG quality reviewers as follows:

- A = The data submitted was assessed as being sound with nothing being identified that might affect its integrity.
- B = The submission appears fundamentally sound but there are some factors which could affect the integrity of the submitted data.
- C = Due to significant data not being provided, it was not possible to assess the integrity of the submitted data.
- D = Due to one factor or a combination of factors, little credibility should be given to the submitted data.

Whenever possible, type "A" data were selected.

### **Same source nations**

After matching on project size and quality, if an ON project could be comparably paired with a number of OFF projects, the ON and OFF projects which had the same client (source nation) were paired. For example, if an ON project where the client was the U.S. could be matched with a project where Canada offshores to China or Germany offshores to Mexico or the US offshores to India, the project which has the US offshoring to India was selected. We assume that this choice most clearly illustrates the difference between ON and OFF projects.

As it turns out, no further elimination was needed to match an ON to an OFF.

**Resultant data set.**

Using the above selection criteria, we were able to reduce the set of selected projects with similar characteristics. A total of 57 matched pairs were obtained, which reflected participation by 17 client and vendor nations over the period 1991-2003, with each project in the matched pairing beginning within one year of its paired project.

**Statistical Tests**

To compare variables between ON and OFF project pairings, the Wilcoxon signed rank test was performed (Field, 2002). This test is a nonparametric alternative to the paired t-test and has less stringent assumptions although it is generally more powerful than the Sign Test. As with other paired tests, it assumes that we have two groups and that we have drawn our sample in pairs, but it does not require assumptions about the form of the distribution of the measurements. Each pair contains an item from the first group and an item from the second group. This procedure tests the hypothesis that the frequency distributions for the two groups are identical. Exact p-values are computed for small sample sizes. In the present case, we have two sets of values to compare (ON and OFF), project size and data quality being the controlling factors. We want to find significant changes (if any) in various performance indicators. The z-score in the Wilcoxon signed rank test calculates the exact significance, based on a normal distribution.

**Results**

Table 3 shows typical values for several performance variables for ON and OFF projects obtained from the project database (ISBSG, 2004). Both the mean and standard deviation are shown for both outsourcing categories as well as for all off the projects considered (provided as a basis of comparison).

**Table 3.**  
**Performance variable values**

Measures	ON		OFF	
	Mean	Std. Dev	Mean	Std. Dev
<b>Completion Time (Months)</b>	9.67	11.988	8.65	7.14
<b>Project Work Effort (Hours)</b>	7,558	10,985	5,711	3,648

**Table 4.**  
**Wilcoxon Signed Rank Test Results for the performance variables**

	Completion Time	Work Effort
<b>Z</b>	-2.889 (a)	-.942 (a)
<b>Asymptotic Sig. (2-tailed)</b>	<b>0.004</b>	.346
<b>N</b>	48	57

(a) OFF < ON<sup>6</sup>

(b) ON < OFF

<sup>6</sup> In all cases, if the Z score is based on OFF < ON and the sign is negative, then the implication is that OFF > ON

We first tested for the statistical significance of the differences in our measures between ON and OFF projects using the Wilcoxon Signed rank test. The overall results are presented in Table 4. From Table 4, we observe that:

1. The time required to complete a project of similar size, undertaken at approximately the same time, and of the same data quality is significantly less for ON projects than for OFF projects (RQ1).
2. The normalized work effort is not statistically different than those found in ON projects (RQ2)

We next investigate which technical factors vary between ON and OFF projects. Table 6 shows the results of the Wilcoxon Signed Rank test for differences between ON and OFF development types.

**Table 5.**  
**Differences in Development Types (Willcoxon Signed Rank test)**

	<b>OFF - ON</b>
<b>Z</b>	-3,962(b)
<b>Asymptotic Significance (2-tailed)</b>	<b>0.009</b>
<b>N</b>	46

- (a) OFF < ON  
(b) ON < OFF

The results indicate that new software projects are more likely to be OFF while re-development projects are more likely to be ON (RQ3).

Our next analysis involves differences in application type: Transaction Processing Systems (TPS) versus Management Information Systems (MIS). The results are given in Table 6.

**Table 6.**  
**Differences in Application Types (Willcoxon Signed Rank test)**

	<b>TPS</b>	<b>MIS</b>
<b>Z</b>	-1.567(a)	-1.826(a)
<b>Asympt. Signif. (2-tailed)</b>	0.117	<b>0.068</b>
<b>N</b>	50	50

- (a) OFF < ON  
(b) ON < OFF

The results indicate that MIS are more likely to be completed offshore and there is weak significance for the finding that TPS projects are more likely to be performed as ON projects. This could be expected since TPS require data that is generated locally, whereas MIS data need not be collected in real-time and thus are more easily transported.

The next analysis involved the differences in system architecture (Table 7).

**Table 7.**  
**Differences in computer architecture (Willcoxon Signed Rank test)**

	<b>Stand Alone</b>	<b>Client Server</b>
<b>Z</b>	-1.567(b)	-1.826(a)
<b>Asympt. Signif. (2-tailed)</b>	<b>0.000</b>	<b>0.000</b>
<b>N</b>	46	46

(a) OFF < ON

(b) ON < OFF

The results show that client server projects tend to be OFF projects whereas ON projects tend to use stand-alone architecture (RQ5).

The next analysis involved the differences in development platform (Table 8). Three classifications were selected: PCs, Mid Range and Main Frame Computers.

**Table 8.**  
**Differences in Development Platform (Willcoxon Signed Rank test)**

	<b>PC</b>	<b>Mid-Range</b>	<b>Main-Frame</b>
<b>Z</b>	-1.775(b)	-1.826(b)	-4.111(a)
<b>Asympt. Signif. (2-tailed)</b>	0.439	<b>0.000</b>	<b>0.000</b>
<b>N</b>	53	53	53

(a) OFF < ON

(b) ON < OFF

There are insignificant differences in PC projects, but Mid-Range projects tend to be OFF projects while Main-Frame projects tend to be ON projects (RQ6).

The final analysis involved the differences in the type of language used (Table 9). Five classes of languages were considered: Fourth generation languages (4GL), third generation languages (3GL), Application generators (APG), C/C++, and COBOL.

**Table 9.**  
**Differences in Development Languages (Willcoxon Signed Rank test)**

	<b>4GL</b>	<b>3GL</b>	<b>APG</b>	<b>C/C++</b>	<b>COBOL</b>
<b>Z</b>	-1.000(a)	-1.756(a)	-2.183(b)	-2.236(a)	-3.286(b)
<b>Asympt. Signif. (2-tailed)</b>	0.317	0.000	<b>0.029</b>	<b>0.025</b>	<b>0.001</b>
<b>N</b>	52	52	52	50	50

(a) OFF < ON

(b) ON < OFF

While there are no differences with respect to 4GLs (in general), both APG and COBOL projects tend to be ON projects while C/C++ tends to be OFF projects (R7).

A summary of the differences in technical components between ON and OFF projects is presented in Table 10.

**Table 10.**  
**Summary of Significant differences in Technical factors between ON and OFF Projects**

<b>Factor</b>	<b>ON</b>	<b>OFF</b>
<b>Development Type:</b> New Development Redevelopment	<b>X</b>	<b>X</b>
<b>Application Type:</b> MIS		<b>X</b>
<b>Architecture:</b> Stand Alone Client Server	<b>X</b>	<b>X</b>
<b>Development Platform:</b> Mid-Range Main-Frame	<b>X</b>	<b>X</b>
<b>Programming Language:</b> APG C/C++ COBOL	<b>X</b>  <b>X</b>	  <b>X</b>

### Discussion

The finding that OFF projects requires more time to complete was expected. This corresponds to Efendioglu et al., (2005) finding that ISPOs require more time to finish and efforts in the early and the later stages of a project, where communication is critical. In a recent Accenture survey of 200 U.S. businessmen, 76% of the managers questioned identified different communication styles as the key factor causing problems between onshore and offshore workers (Businessweek, 2006b). Different approaches to completing tasks, different attitudes toward conflict and different decision-making styles were cited as the other main cultural factors that frequently cause upsets and thus increase elapsed times of projects when managing an offshore outsourcing relationship.

The finding that there was no significant difference in normalized work effort was surprising. However, the relative shortage of observations ( $N = 57$ ) appears to have contributed to this result.

With respect to technology factors, some interesting findings were uncovered. OFF projects tend to new client-server, Management Information System (versus TPS) applications, developed on mid range computers. The use of standard/traditional programming languages and tools, presumably because the vendor countries have lower labor costs cheaper and the use standard software is more commonplace. The use of client-server architecture and application of standard/traditional programming languages such as C/C++ may be a consequence of strategic considerations on the part of the client (such as freeing up resources, not directly investing in debatable technologies but quick use of existing infrastructure of other firms elsewhere). These two factors are considered as most important reasons for IS outsourcing projects (Saunders et al., 1997).

## Conclusions

To the best of our knowledge, this is the first empirical study of its kind to explore several issues involving ON and OFF projects. Since all of the projects selected have been implemented, we can label them successful.

This preliminary study has some limitations. Even though the ISBSG (2004) contains a large amounts of data on a number of factors, our pairing criteria reduced the number of observations severely. For example, we would have liked to contrast the difference in projects (as measured by Total Defects Delivered) but our constraints, especially that of pairing only ON and OFF projects which had the same approximate starting times, reduced the number of paired projects to five. Hopefully, as additional projects are added to the database, this will not be a concern.

This was an exploratory study. As noted, the ISBSG has data on a number of different factors, allowing for extensive divergent research. Future work can investigate in detail issues like productivity, user satisfaction and subsequent maintenance costs. The issue of differing cultures behind the outsourcer and the OFF vendor also needs attention. Structured equation modeling (SEM) techniques can be used to analyze these and other important issues in software projects.

## References

1. Agosta, L. "Data Quality Project Cost Drivers". Forrester Research, August 2001.
2. Barney, J. B. "Firm Resources and Sustained Competitive Advantage." *Journal of Management* 17(1), 1991, pp. 99-120.
3. *BusinessWeek*, January 30, 2006(a).
4. *BusinessWeek*. "Culture Clashes Harm Offshoring". July 17, 2006(b)
5. Carmel, E., and Tjia, P. *Offshoring Information Technology - Sourcing and Outsourcing to a Global Workforce*. Cambridge University Press, 2005.
6. Dobbs, L. *Exporting America: Why Corporate Greed Is Shipping American Jobs Overseas*. Warner Business Books. 2004.
7. Earl, M.J. "The Risks of Outsourcing IT," *Sloan Management Review*, 37(3), 1996, pp. 26-32.
8. Efendioglu, A.M. and Cejka, K. "Offshore outsourcing, a survey of venture capital firms," *USF Business Quarterly*, February 8, 2005.
9. Heales, J., Cockcroft, S. and Radulescu, C. O. "The Influence of National Culture on the Level and Outcome of IS Development Decisions," *Journal of Global Information Technology Management*, 7(4), 2004, pp. 3-28.
10. Rudy Hirschheim, R (Initiating author). *Information systems outsourcing*, *ISWorld Encyclopedia* , [http://ispedia.terry.uga.edu/?title=Information\\_systems\\_outsourcing](http://ispedia.terry.uga.edu/?title=Information_systems_outsourcing). Last accessed May, 2005.
11. ISBSG. "The ISBSG Estimating, Benchmarking & Research Suite Release 9," *International Software Benchmarking Standards Group (ISBSG)*, November 2004.

12. ISBSG. "Glossary of Terms". V5.9.1.doc. 28/02/06. Available at: [http://www.isbsg.org/html/Glossary\\_of\\_Terms.doc](http://www.isbsg.org/html/Glossary_of_Terms.doc)
13. Jeffrey, R., Ruhe, M. and Wieczorek, I. "A Comparative Study of two software Development Cost Modeling Technique Using Multi-Organizational and Company Specific Data," *Information and Software Technology* (42) 2000, pp. 1009-1016.
14. Ketler, K. and Willems, J.R. "A study of the outsourcing decision: preliminary results," *Proceedings of the 1999 ACM SIGCPR conference on Computer personnel research*, p.182-189, April 08-10, 1999, New Orleans, Louisiana, United States.
15. Krishnan, M., Kriebel, C., Kekre, S. and Mukhopadhyay, T. "Productivity and Quality in Software Products," *Management Science*, 46(6), 2000, pp. 745-759.
16. Lacity, M.C. and Hirschheim, R.A. "The Information Systems Outsourcing Bandwagon," *Sloan Management Review*, 35(1), 1993, pp. 73-86.
17. Lokan, C.J., "An Empirical Analysis of Function Point Adjustment Factors," *Information and Software Technology* (42) 2000, pp. 649-660.
18. McFarlan, F.W. and Nolan, R.L. "How to manage and IT Outsourcing Alliance," *Sloan Management Review*, Winter: 1995, pp. 9-23.
19. Neely, A., Gregory, M., and Platts K. "Performance measurement system design", *International Journal of Operations & Production Management*, 25(12), 2005, pp. 1228-1263
20. Saunders, C., Gebelt, M. and Hu, Q., 1997. "Achieving Success in Information Systems Outsourcing: California Management Review, 39(2), Winter: pp. 63--79.
21. Smith, M.A., Mitra, S. and Narasimhan, S. "Offshore outsourcing of software development and maintenance: a framework for issues," *Information and Management*, 31(3), 1996, pp.165-175.
22. Strong, D.M., Lee, Y.M., and Wang, R.Y. "Data Quality in Context". *Communications of the ACM*, 40(5), May 1997, pp. 103-110.
23. Udo, G.J. "Empirically Comparing Information Systems Outsourcing with End-User Computing Development, *International Journal of Business Performance Management*, 1(3), 1999, pp. 299-311.
24. United Nations Conference on Trade and Development (UNCTAD). "Service offshoring takes off in Europe – In search of improved competitiveness". 2004.
25. Willcocks, L.P., Fitzgerald, G. and Lacity, M.C. "To Outsource IT Or Not? Recent Research on Economics and Evaluation Practice," *European Journal of Information Systems*, 5(3), 1996, pp. 143-160.
26. Wikipedia, "Ross Perot", [http://en.wikipedia.org/wiki/Ross\\_Perot](http://en.wikipedia.org/wiki/Ross_Perot), Last accessed March, 2007