Chapter 9

Towards a Netsourcing Decision Model: An Empirical Evaluation of Criteria Determining Organizational Decision Making

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Abstract

Among the broad range of outsourcing offerings, netsourcing presents a relatively new one. Netsourcing allows companies to selectively source software applications from external providers via the Internet. External providers claim cost advantages over in-house development and operations of software applications. Theory however lists a number of arguments against outsourcing, leaving organizations with a decision problem of whether to netsource or not.

We introduce a decision model encompassing decision criteria from Strategic Management and Transaction Cost Economics, two theoretical approaches prominently applied to full IT outsourcing. We test seven hypotheses based on a 2004 survey among the 500 largest companies nationwide. Finding support for the decision criteria from Strategic Management and for four out of five from Transaction Cost Economics, Technical Specificity, Human Capital Specificity, Transaction Frequency and Transaction Uncertainty. We conclude with managerial recommendations concerning organizational netsourcing decisions and suggestions for future research.

Keywords

Netsourcing Decisions, Decision Model, Strategic Management, Transaction Cost Economics, Empirical Survey

1. Introduction

Since the introduction of business computing, the complexity of and investment in Information Technology (IT) has increased tremendously. Along with this development, a trend towards netsourcing emerges. Kern et al. (2002) refer to netsourcing as "the practice of renting or 'paying as you use' access to centrally managed business applications, made available to multiple users from a shared facility over the Internet or other networks via browser-enabled devices". Thereby, netsourcing can be classified as one specific outsourcing subset in the IS field (Currie, Seltsikas 2001).

IS outsourcing decisions have been addressed by many researchers (e.g., Ang, Cummings 1997; Lee et al. 2003; Dibbern et al. 2004). However, not only in the direct aftermath of the famous Kodak outsourcing deal (Loh, Venkatraman 1995), much of this research stresses full outsourcing of entire departments (e.g., Reponen 1993; Cheon et al. 1995; Slaughter, Ang 1996; Ang, Straub 1998; Willcocks, Lacity 1998; Hancox, Hackney 2000).

In the fragmented palette of outsourcing offerings, selective outsourcing refers to outsourcing of individual Information Systems (IS) functions (e.g., maintenance, hosting) or individual IS dominated processes such as payroll or human resource management (Lacity et al. 1996; Willcocks, Lacity 1998; Lacity, Willcocks 2001).

With the advent of Application Service Provision (ASP) as the initial netsourcing business model, the option to externally source selected software applications including their development, hosting, and maintenance was added to the decision calculus (Seltsikas, Currie 2002).

Only recent technological developments such as webservices and middleware have fostered IT modularity and interoperability. Both are necessary for making netsourcing technically feasible (Ferris, Farrell 2003).

But technical feasibility is no sufficient reason for a positive netsourcing decision. Instead significantly more complex decision problems have to be solved. Similarly, back in 1937, Coase (1937)

stressed the decision element in sourcing when he referred to sourcing issues as make-or-buy decisions. This suggests the eminent need for decision tools supporting the complex managerial issue of netsourcing.

Hence we see our decision model in the light of the organizational decision making school, which was promoted by Simon (1947; 1957) and Cyert, March (1963) and has become one of the major foundations for Decision Support Systems (DSS) research. The organizational decision making school categorizes different decision types according to the degree to which a decision can be structured. This opens a continuum from structured to unstructured (Gorry, Scott Morton 1971) and respectively programmed to non-programmed (Simon 1947) decision making situations.

We then follow Lorange and Scott Morton (1974) who deem make-or-buy decisions as structured decisions. For such structured decisions, decision support tools are generally feasible and helpful. Our contribution in this paper is to determine the decision criteria that play a key role in netsourcing and therefore have to be comprised in a DSS for supporting netsourcing decisions.

To further focus our work, we draw on Simon's (1960) stage model. Simon distinguishes between the intelligence, design, choice, and implementation stages of decision making. We focus on the choice stage and strive to introduce a model that supports the decision whether a company should netsource or not - the so-called netsourcing decision.

For potential decision criteria to be included in such a model, we turn to existing theory.

Traditionally, potential advantages of outsourcing have been described as production cost savings due to economies of scale on the supplier side (Coase 1937). Transaction costs, however, may countervail production cost savings, thereby endangering a cost savings effect on the client side (Williamson 1981).

Even if assuming a positive cost savings projection, outsourcing opportunities confront companies with hurdles resulting from diversity in their IT departments. Both, individual, rather elementary software applications and IS dominating business processes such as Customer Relationship Management (CRM) and Supply Chain

Management (SCM) offer strategic value to the sourcing company (Porter 1985; Hilmer, Quinn 1994).

This argument has frequently been raised with regard to outsourcing complete IT departments. We consider them equally relevant to netsourcing decisions. Therefore, following the literature on full IT outsourcing (e.g., Earl 1991; Cheon et al. 1995; Ang, Cummings 1997; Willcocks, Lacity 1998; Hancox, Hackney 2000; Lee et al. 2003; Dibbern et al. 2004), we aim at investigating the role that the strategic value of software applications and transaction cost drivers play in the netsourcing decisions.

We introduced a decision model based on seven potential netsourcing decision criteria derived from the literature on Strategic Management and Transaction Cost Economics. Data was gathered from a 2004 survey of the largest 500 companies nationwide. Seven hypotheses concerning the relevance of selected decision criteria in organizational netsourcing decisions were tested against that data.

2. Introducing the Netsourcing Decision Model

2.1. The Netsourcing Decision

The central construct of our decision model (see Figure 1) is the netsourcing decision. Any sourcing decision must be regarded as a 'make-or-buy' decision.

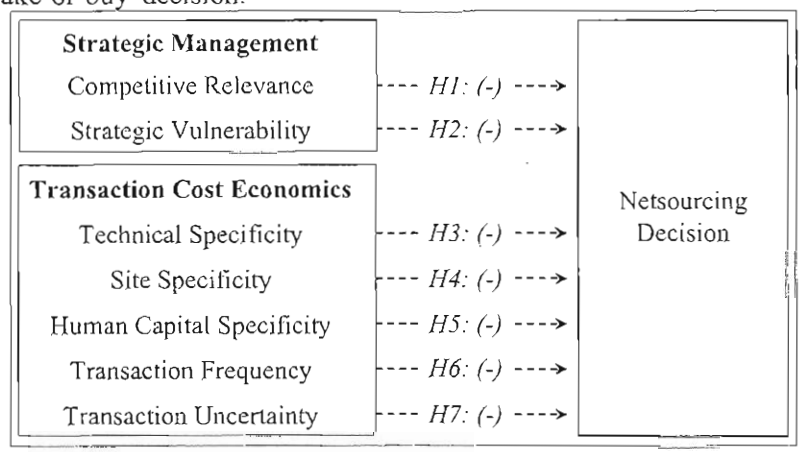

Figure 1. Netsourcing Decision Model

As elaborated above, we consider netsourcing as selectively sourcing software applications via the Internet from external service providers (Kern et al. 2002). With the netsourcing decision as dependent variable, the underlying assumption is that companies only netsource if they anticipate an economically positive outcome. With this assumption, we can abstract the netsourcing decision from outcome measures such as success or performance constructs (DeLone, McLean 1992).

At the point of time a netsourcing decision is made outcome measures can only be projected. Only ex post - following implementation - decision outcomes can eventually be collected as data.

This research does not intend to justify a netsourcing decision ex-post by measuring performance advantages or disadvantages of. Instead we investigate decision criteria regarding their suitability and applicability for supporting netsourcing decisions prior to outcome measures being available.

2.2. Decision Criteria and Research Hypotheses

As independent variables, we propose potential criteria from Strategic Management and Transaction Cost Economics which have already been tested for full outsourcing decisions (e.g., Ang, Straub 1998; Poppo, Zenger 1998; Hancox, Hackney 2000; Benoit et al. 2004).

Strategic Management literature conveys that a few distinct capabilities differentiate companies from competitors (Hamel, Prahalad 1990). Software applications potentially bear such capabilities, thereby differentiate companies from competitors and consequently possess strategic relevance for the company. Corporate decision makers may not replace strategically relevant software applications with rather commoditized ones offered by external providers (Hilmer, Quinn 1994; Willcocks, Lacity 1998).

H1: Software applications of companies that netsource have significantly less competitive relevance than those that do not netsource.

A competitive advantage may also result from a distinct capability that drives an entire business process such as SCM or CRM. A...

competitive advantage in a business process often results from collaboration across several company departments. Selectively outsourcing, one element of such a business process, i.e. one software application, possibly risks the outcome of the entire process (Hilmer, Quinn 1994; Jurison 1995; Loh, Venkatraman 1995); hence the software application risks strategic vulnerability.

H2: Software applications of companies that netsource expose the company to significantly more strategic vulnerability than those of companies that do not netsource.

Sourcing decisions also can have a cost perspective. Production costs are generally assumed to decrease due to outsourcing induced economies of scale on the supply side (Lacity, Hirschheim 1993; Kern et al. 2002). Transaction costs arise as a result of finding, managing, and controlling external service providers (Barthelemy 2001). An organization will favor outsourcing, if the production cost savings outweigh the transaction cost induced expenses (Ang, Straub 1998).

Based on this cost comparison and the drivers underlying the different types of transaction costs, we develop five hypotheses, H3 to H7:

The software portfolio of a company contains commoditized applications (e.g., mail client, spreadsheet software) and customized ones (e.g., ERP software). In Transaction Cost Economics, asset customization and even individualization are discussed under asset specificity which has technical, human-resource, and localization components (Williamson 1985).

Sourcing customized applications externally offers some economies of scale from central hosting and maintenance. However, cost saving effects from software development are limited. Applications are either developed upon request by the external service provider or they are developed in-house at the customer site and then delivered to the outsourcing company for service provision. Subsuming application customization under the term technical specificity, we hypothesize it to have a negative influence on the netsourcing decision making (Stuckey, White 1993).

H3: Software applications of companies that netsource are significantly less customized than those of companies that do not netsource.

Software applications can run either on a client or on a server. Server based applications are accessed remotely either via a specific client or via a common web browser. Long distance may occur between client and server. Companies may consider network security, network reliability and network control as reasonable threats due to site specificity and attribute negative net cost effects to externally sourced applications (Stuckey, White 1993).

H4: Software applications of companies that netsource are significantly more site specific than those of companies that do not netsource.

A company's IT department acquires, trains, and holds specific human capital (Stuckey, White 1993; Nam et al. 1996) for developing and maintaining software applications. Especially for development purposes, the staff accumulates process know-how beyond general IT knowledge. In case such specific human capital is required for software development and maintenance, management may decide against netsourcing (Dibbern et al. 2005).

H5: Software applications of companies that netsource require significantly less specific human capital than those of companies that do not netsource.

Software applications are rarely purchased in discrete intervals. Especially when netsourced, the transaction frequency of software applications results from the frequency of adaptations made to the software or its underlying contracts. Consequently, companies may decide not to netsource applications with a high transaction frequency (Poppo, Zenger 1998).

H6: Business processes of companies that netsource show significantly less need for adaptations than processes of those that do not netsource.

Governing development, hosting, and maintenance externally add costs due to transaction uncertainty when no direct control is possible (Klein et al. 1978; Poppo, Zenger 1998). Such indirect performance measurement may exert prohibitively high costs. For these reasons, netsourcing decisions may depend on the level of transaction uncertainty (Benoit et al. 2004).

H7: Software applications of companies that netsource inherit significantly less transaction uncertainty than applications of those that do not netsource.3. Methodology

3. Methodology

To test the seven hypotheses, we conducted a survey on the 500 largest companies nationwide based on total sales. From the alphabetical list of 500, we systematically drew a sample (Cochran 1977) of 333 companies. From these we eliminated 41 companies due to a shared IT department with the parent company also included in the sample. Furthermore, 54 companies were eliminated from the list as they could not be contacted. We ended up with 238 companies for our survey research.

Within each of the 238 sample companies, we targeted the Chief Information Officer or the IT manager - whoever was in charge of IT decision making. They received a questionnaire containing all relevant definitions and a total of eight questions by mail or fax. If they did not answer within 21 days - they also received a phone call. 88 responded. This procedure led us to 88 replies which calculated to a response rate of 36.97%.

On a binary scale [0;1], we coded whether a company was netsourcing or not. For each of the seven independent variables we asked respondents to assess a statement regarding their company's software applications on a Likert-type scale [1;5]. A '1' represented verification for very few applications and '5' for all or none of the software applications.

To assure the sample validity and decrease the risk of a non-respondent bias, we conducted a t-test comparing respondents with non-respondents. We compared total sales and the number of employees of each company (Teng et al. 1995; Lee et al. 2004). The underlying hypothesis was that there was a difference of means. Assuming the absence of non-respondent bias was justified for an insignificant t-statistic ($SIG_T > 0.05$).

We also chose a t-test for testing our research hypotheses. The t-test compares the means of two independent samples and calculates its significance. Separating companies that netsourced from those that did not netsource, we obtained two sufficiently independent sub-samples.

Before proceeding, besides the independency of samples, two assumptions of the t-test had to be confirmed (Gardner 1975), normal distribution within both samples and homoscedasticity.

For measuring the approximation to a normal distribution, we calculated a Shapiro-Wilk test (instead of a Kolmogorov-Smirnov test) due to the relatively small sample size. The assumption of a normal distribution is confirmed if the Shapiro-Wilk W-statistic is close to 1 and insignificant ($SIG_{SW} > 0.05$).

Homoscedasticity means that when comparing both samples, the variance among the distributed variable is required to be similar. We measured this by calculating differences of variances between the sub-samples using the Levene's test. Homoscedasticity can be assumed if the difference in variance is insignificant ($SIG_L > 0.05$).

Finally, we considered a research hypothesis confirmed if the means of the two samples were significantly different ($SIG_T < 0.10$) and the direction of the difference of means corresponded with the hypothesis.

4. Results and Findings

We divided the respondents in two sub-samples, companies that netsource and those that do not netsource. Concerning the validity of our sample, no non-respondent bias was discovered as the t-statistic was insignificant for total sales ($SIG_T = 0.828 > 0.05$) and number of employees ($SIG_T = 0.912 > 0.05$).

With regard to reliability of the method related to our sample data, we checked the two assumptions of the t-test, normal distribution and homoscedasticity, as described in the methodology section. The Shapiro-Wilk W-statistic showed values close to 1. The lowest W-value within both sub-samples was $W > 0.85$ (see Table 1). Even though showing sufficient W-values, it was not insignificant (see Table 1).

	Netsourcing (N=54)		No Netsourcing (N=34)	
	W	Sig.	W	Sig.
Competitive Relevance	0.867	0.000	0.891	0.003
Strategic Vulnerability	0.902	0.000	0.881	0.001
Technical Specificity	0.892	0.000	0.869	0.001
Site Specificity	0.889	0.000	0.854	0.000
Human Capital Specificity	0.907	0.010	0.878	0.001
Transaction Frequency	0.892	0.000	0.904	0.006
Transaction Uncertainty	0.898	0.000	0.912	0.010

Table 1. Shapiro-Wilk W-statistic for normal distribution among netsourcing and not netsourcing companies

	F	Sig.
Competitive Relevance	2.321	0.131
Strategic Vulnerability	2.093	0.152
Technical Specificity	2.331	0.130
Site Specificity	0.281	0.598
Human Capital Specificity	0.000	0.987
Transaction Frequency	0.000	0.994
Transaction Uncertainty	0.149	0.701

Table 2. Levene's test for homoscedasticity between companies netsourcing and those not netsourcing

The Levene's test showed an insignificant F-statistic for the relationship between each pair of factors (see Table 2), indicating that there was no significant difference of variance between the companies that netsource and those that do not.

We then performed a t-test of independent samples to check our seven research hypotheses of the decision model. The results are depicted in Table 3.

	Netsourcing (N=54)		Not Netsourcing (N=34)			
	Mean	S.D.	Mean	S.D.	T	Support
Competitive Relevance	2.44	1.110	3.38	1.326	-3.577 ***	Yes
Strategic Vulnerability	2.65	1.067	3.53	1.237	-3.547 ***	Yes
Technical Specificity	2.54	1.224	3.03	1.507	-1.678 *	Yes
Site Specificity	3.44	1.040	3.68	1.199	-0.960	No
Human Cap. Specificity	3.00	1.213	3.53	1.187	-2.010 **	Yes
Transaction Frequency	3.04	1.009	3.41	0.988	-1.710 *	Yes
Transaction Uncertainty	2.69	1.006	3.32	1.065	-2.833 ***	Yes

*** significant at Sig < 0.01 H Hypothesis
** significant at Sig < 0.05 S.D. Standard Deviation
* significant at Sig < 0.10

Table 3. T-test on difference of means among companies netsourcing and those not netsourcing

Concerning both Strategic Management criteria, Competitive Relevance and Strategic Vulnerability, the mean value was significantly lower for companies that netsource than for those that do not netsource (H1 and H2 confirmed). The same held true for four out of five Transaction Cost criteria. Technical Specificity, Human Capital Specificity, Transaction Frequency, and Transaction Uncertainty have significantly lower means for companies that netsource compared to those that did not netsource (H3, H5, H6, and H7 confirmed). However, Technical Specificity and Transaction Frequency showed lower significance ($SIG_T < 0.10$). Differently, Site

Specificity did not show any significantly lower mean for the netsourcing sub-sample compared to the sub-sample that does not netsource (H4 not confirmed).

We found support for both Strategic Management and four out of five Transaction Cost criteria.

Strategic Management: Companies that netsourced ascribed the source of competitive advantage within a process less to software applications than those companies that did not netsource. Similarly, companies that avoided netsourcing feared more strategic vulnerability resulting from netsourcing than those that netsourced. Those findings validate the Strategic Management findings of full IT outsourcing.

Transaction Costs: Two out of three asset specificity related factors played a major role. Companies that netsourced tended to have less customized software applications and less specific development and maintenance know-how than companies that did not netsource. On the other hand, companies with a need for especially skilled personnel and specifically customized software applications netsourced less. Site Specificity, the remaining asset specificity factor, seemed less relevant.

The location of the hosting site did not present a restraining criterion to netsourcing decisions. This could possibly be explained by the distributed nature of corporate IT networks. Many global companies run applications on central servers and access applications with a client from any place in the world. Our instrument did not take into account the perceived distance caused by governing structures, an issue which was also considered relevant when pondering netsourcing advantages.

Adaptations of applications and the accompanying contracts occurred less frequently in companies that netsourced compared to those that did not. Finally, transaction uncertainty that incorporated imperfect and costly control mechanisms was less important to netsourcing companies compared to not netsourcing ones. Overall, transaction costs for searching, managing, and controlling the sourcing relationship need to be balanced against production cost savings.5. Major Insights

5. Major Insights

DSS Design: DSS for supporting netsourcing decisions should integrate variables concerning the strategic value caused by the software application under consideration. This necessitates an evaluation of each application, ranking applications internally according to their strategic value, and finally comparing them to applications operated by competitors (benchmarking).

Concerning the individual decision criteria we gained the following insights

- Caution about netsourcing seems appropriate, if an internal analysis and benchmarking yield *strategic relevance* of an application or *strategic vulnerability* caused by it.
- Netsourcing is especially reasonable if no *company-specific process know-how* is required for development or maintenance.
- The *hosting location* does not serve as a good indicator for netsourcing suitability; nor does remote hosting signal appropriateness, neither does in-house hosting point at inappropriateness.
- *Extensive and recurring software adaptations* restrain netsourcing as they pose a tremendous cost factor to netsourcing.
- Finally, widespread *control mechanisms* lead to less netsourcing. Applications with easily measurable results are most suitable for netsourcing, while those which need complex and indirect oversight and control ought to be handled cautiously with regard to netsourcing.

6. Summary and Future Research

This paper presented introductory research into organizational netsourcing decisions. Netsourcing, a contemporary IT outsourcing phenomenon, describes selectively sourcing software applications via the Internet.

We investigated whether the same decision criteria that apply to full IT outsourcing also apply to netsourcing decisions: In a first step, we introduced a decision model based on strategic management and

on transaction cost literature. Both are dominant theoretical approaches to full IT outsourcing. Then, we analyzed the data gathered from a survey conducted among the 500 largest companies nationwide.

We found that the decision criteria derived from the field of strategic management, Competitive Relevance and Strategic Vulnerability, and four out of five decision criteria from transaction costs, namely Technical Specificity, Human Capital Specificity, Transaction Frequency, and Transaction Uncertainty played a major role in netsourcing decisions. Hence, the relevant decision criteria were identified and the direction of their influence on the netsourcing decision was determined.

But more research is needed: A larger sample that allows for additional statistical analysis would further validate current intermediate insights. Surveying also small and medium-sized companies (SMEs) should provide additional insights concerning decision criteria and organizational decision making with regard to personnel, resources, and other contextual factors.

Eventually, future work may want to measure the influence and explore potential interdependencies among the decision criteria for further fine-tuning the decision model. In such an endeavor, even the construct 'netsourcing decision' could be reconsidered. Applying a performance construct as dependent variable would allow for more precise evaluations of netsourcing decisions. However, introducing such a performance construct might cause some common method bias which could outweigh the current assumption of 'rational decision making'.

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