Empirically Evaluating Determinants of Netsourcing as Innovative eBusiness Sourcing Opportunity

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Abstract

Netsourcing describes an eBusiness subset of overall IT outsourcing, in which companies can selectively source software applications from external providers via the Internet. Companies which netsource seem to enjoy cost and flexibility improvements compared to those which develop and operate software applications in-house.

For investigating netsourcing, we draw on full outsourcing research for a possible theoretical grounding. Literature on IT outsourcing offers several research streams suggesting determinants and explaining value creation through and pitfalls due to IT outsourcing. In order to narrow those perspectives down, we use a research framework based on two theoretical approaches, strategic management and transaction cost economics. We survey a sample of the 500 largest German companies to investigate netsourcing determinants. Competitive relevance of an application, strategic vulnerability, technical specificity, human capital specificity, transaction frequency, and transaction uncertainty are supported as determinants of a company's netsourcing decision. After some lessons learned and the respective managerial implications, we point to some conceptual limitations of the study and conclude with a summary and a research outlook.

Keywords: outsourcing, strategic management, transaction cost economics

1.   Introduction

Following Straub and Watson (2001, p.338) a "net-enabled organization (NEO) coordinates activities and interacts with its stakeholders through the exchange of messages over electronic networks". This statement also holds true for the current eBusiness trend of netsourcing. Kern et al. (2002, p.1) define 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". This definition classifies netsourcing as one eBusiness specific outsourcing subset (Currie, Seltsikas 2001; Desai et al. 2003).

Since the Kodak outsourcing deal (Loh, Venkatraman 1995), IT outsourcing has been brought up and analyzed by many researchers (e.g., Ang, Cummings 1997; Lee et al. 2003; Dibbern et al. 2004). The largest proportion of this research emphasizes full outsourcing, i.e. outsourcing the entire IT department (e.g., Reponen 1993; Cheon et al. 1995; Slaughter, Ang 1996; Ang, Straub 1998; Willcocks, Lacity 1998; Hancox, Hackney 2000). The outsourcing palette, however, is fragmented far beyond full outsourcing. The concept of selective outsourcing refers to outsourcing of individual IS functions (e.g., maintenance, hosting), individual IS dominated business processes such as Supply Chain Management (SCM) or Customer Relationship Management (CRM), or at the most granular level, IS applications such as payroll or human resource management applications (Lacity et al. 1996; Willcocks, Lacity 1998; Lacity, Willcocks 2001).

Application Service Provision (ASP), even though dragged under by the dotcom downturn, depicted an initial formation of a netsourcing business model. Via the Internet, ASPs offer a range of fixed and non-integrated software applications deploying the browser as user interface. Examples of such applications were single office applications. Service provision covered application development, hosting, and maintenance (Seltsikas, Currie 2002).

Recently, the availability of webservices and middleware has facilitated interoperability and subsequently modularity of applications and thus increased the technical feasibility of netsourcing (Ferris, Farrell 2003).

Beyond technical feasibility, other components need to be taken into account in netsourcing decisions. As outsourcing in general, netsourcing has a strategic component to it. Drucker (1966) differentiates strategic issues as either efficiency or effectiveness issues, i.e., doing things right versus doing the right things. Applying Drucker's phrase to IS, Melville et al. (2004) pose the question whether "the IT resource [is] associated with improved operational efficiencies or competitive advantage".

Relating this question to netsourcing, we ask whether the same strategic determinants concerning operational efficiency and competitive advantage apply to netsourcing that were found to be relevant for full outsourcing.

The strategic management literature offers many discussions on the effectiveness perspective of strategy (e.g., Cameron, Whetten 1983; Venkatraman, Ramanujam 1986; Wiener 1988). It argues that outsourcing confronts companies with strategic pitfalls resulting from diversity and heterogeneity in their IT departments (Dibbern et al. 2004). Among a company's resources, individual software applications and IS dominated business processes may contain strategic value and consequently present a source of competitive advantage to the sourcing company, whereas others are strategically irrelevant (Porter 1985; Hilmer, Quinn 1994).

Following transaction cost economics (TCE), outsourcing advantages emerge from production cost savings due to economies of scale on the supplier side and thus result in efficiency increases (Coase 1937). Transaction costs, however, may countervail production cost savings and thereby endanger a cost savings effect on the client side (Williamson 1979; Williamson 1981).

Strategic management and TCE arguments have frequently been researched with regard to outsourcing complete IT departments. Expanding prior research, we hypothesize that the same arguments are equally relevant to netsourcing decisions. We use a netsourcing research framework (Loebbecke, Huyskens forthcoming 2006) with seven variables derived from the literature on strategic management and TCE and formulate seven hypotheses relating to this framework. Corresponding with specific formulation of hypotheses, we apply mean comparison statistics to test the seven hypotheses. Data

collected for hypothesis testing originates in a 2004 survey among a sample of the largest 500 German companies.

2.   A Netsourcing Research Framework

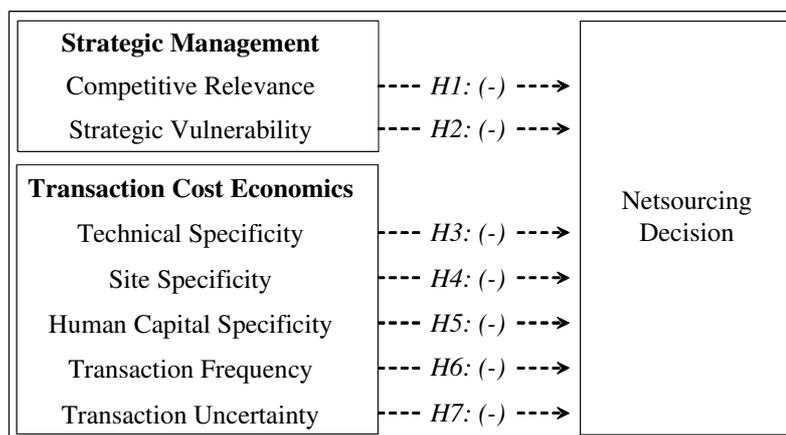The central construct of our netsourcing research framework (see Figure 1) is the netsourcing decision.

Strategic Management		
Competitive Relevance	---- *H1: (-)* ---→	
Strategic Vulnerability	---- *H2: (-)* ---→	
Transaction Cost Economics		Netsourcing Decision
Technical Specificity	---- *H3: (-)* ---→	
Site Specificity	---- *H4: (-)* ---→	
Human Capital Specificity	---- *H5: (-)* ---→	
Transaction Frequency	---- *H6: (-)* ---→	
Transaction Uncertainty	---- *H7: (-)* ---→	

Figure 1: Netsourcing Research Framework (Loebbecke, Huyskens forthcoming 2006)

As elaborated above, we consider netsourcing as selectively sourcing software applications via the Internet from external service providers (Kern et al. 2002) and choose the netsourcing decision as dependent variable. Thus we assume that companies only netsource, if they anticipate an economically positive outcome (Huyskens, Loebbecke 2006). Based on this, we can abstract the netsourcing decision from outcome measures such as a performance or success construct (e.g., Venkatraman, Ramanujam 1987; DeLone, McLean 1992; Melville et al. 2004). However, ex ante, outcome measures can only be estimated. Only ex post - following implementation - can outcomes eventually be collected as data.

We investigate determinants regarding their perceived suitability and applicability for practitioners in supporting netsourcing decisions prior to outcome measures being available. Thus, we do not intend to justify a netsourcing decision ex-post by measuring performance advantages or disadvantages.

As independent variables, we propose determinants based on two research streams, strategic management and transaction cost economics. From the strategic management literature, we select two determinants of strategic value which is a source of competitive advantage. From transaction cost economics, we draw determinants of the production cost versus transaction cost trade-off. Both research streams have already been applied to and validated for full outsourcing (e.g., Halvey et al. 1996; 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; Grant 1991; Kay 1993). Such capabilities could be, for instance, management of customer data or management of supply chain partners. Software applications potentially contain such capabilities and thereby differentiate companies from competitors. Companies do not replace strategically relevant software applications with standardized off-the-shelve applications offered by

external providers with a one-to-many business model (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 originate in 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, may risk the outcome of the entire process (Hilmer, Quinn 1994; Jurison 1995; Loh, Venkatraman 1995). The software application causes 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.

The cost perspective also plays a role in netsourcing. 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). As the extent of transaction costs in this trade-off is determined by certain transaction cost drivers, we develop five hypotheses derived from those, 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 (Klein et al. 1978). Within asset specificity, Williamson (1985) distinguishes technical, human resource, and localization components.

Externally, sourcing customized applications 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 external service providers, or they are developed in-house and then delivered to the outsourcing company for service provision. We subsume application customization under the term technical specificity. Further, we hypothesize that technical specificity has a negative influence on netsourcing (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 a server. Server based applications are accessed remotely either via a specific client or via a common web browser. Long distances may occur between client and server. Network security, network reliability and network control could cause a reasonable threat due to site specificity and thus attribute negative net cost effects to externally sourced applications (Stuckey, White 1993).

> H4: Software applications of companies that netsource are significantly less 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, netsourcing may be denied (Dibbern et al. 2005).

4

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 with regard to 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 adds 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 those reasons, netsourcing 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

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 those 333 companies we eliminated 41 from the list 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.

For surveying the sample companies, we developed a questionnaire consisting of one question and seven statements. In the question respondents were asked whether their company was netsourcing or not. Answers were binary coded [0;1]. The seven statements each referred to one independent variable. The statements contained a definition of the variable as stated in the hypothesis development section. Respondents were asked to assess to what extent the variable applied to their companies software applications. Answers had to be given on a Likert scale with '1' indicating 'very few' and '5' indicating 'all/none' applications, where both 'all' and 'none' do not qualify a company for selective outsourcing.

Within each of the 238 sample companies, we contacted the Chief Information Officer or the IT manager - whoever was in charge of IT decisions. We sent them a questionnaire by mail or fax and - if they did not answer within 21 days – also called them by phone. The procedure resulted in 88 replies which calculated to a response rate of almost 37%.

To assure the sample validity and to 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. The absence of a non-respondent bias could be assumed if an existing difference of means was indicated by a significant t-statistic ($SIG_T > 0.05$).

We also chose a t-test for testing the research hypotheses. The t-test compares the means of two independent samples and calculates its significance. By 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 were tested (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 ($SIG_{SW} > 0.05$).

We checked for homoscedasticity, i.e. for a similar variance among the distributed variable in both samples, 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 to be 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

As explained above, we divided the respondents in two sub-samples, companies that netsourced and those that did 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 $W > 0.85$. Even though showing sufficient W-values, it was not insignificant (see Table 1).

Table 1: *W-statistic testing normal distribution within netsourcing sub-samples*

	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

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.

Table 2: Levene's homoscedasticity test between netsourcing sub-samples

	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

The t-test of independent samples for checking our seven research hypotheses are depicted in Table 3.

Table 3: *T-test on difference of means among netsourcing sub-samples*

	Netsourcing (N=54)		Not Netsourcing (N=34)			
	Mean	S.D.	Mean	S.D.	T	Supported
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 capital 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	S.D.	Standard Deviation
**	significant at Sig < 0.05	H	Hypothesis
*	significant at Sig < 0.10		

Concerning the strategic management determinants, competitive relevance and strategic vulnerability, the mean value was significantly lower for companies that netsourced than for those that did not netsource (H1 and H2 confirmed). The same held true for four out of five transaction cost determinants. Technical specificity, human capital specificity, transaction frequency, and transaction uncertainty had significantly lower means for companies that netsourced compared to those that did not netsource (H3, H5, H6, and H7 confirmed). However, technical specificity and transaction frequency showed lower significance ($SIG_T < 0.10$), i.e. a lower, but still acceptable explanatory power. Only 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).

5. Major Findings

We found support for both strategic management determinants and for four out of five transaction cost determinants; they were identified as crucial to netsourcing.

What did we learn with regard to the strategic management determinants?

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. The threat of decreasing strategic value of software applications and the loss of competitive advantage negatively influenced netsourcing. Those findings validate the strategic management findings from full IT outsourcing for netsourcing.

And what could we conclude regarding the transaction cost determinants?

Two out of three factors related to asset specificity play a major role in netsourcing. Companies that netsourced tended to have less customized software applications and less specific development and maintenance know-how than companies that did not netsource. However, companies with a need for especially skilled personnel and specifically customized software applications netsourced less. Site specificity, the remaining asset specificity factor, however, seemed less relevant.

The location of the hosting site did not play a restraining role as determinant of netsourcing. This can be explained by the distributed nature of corporate IT networks. Global companies that operate applications on central servers and access the application with a client from any place in the world, did not seem to regard the hosting site as critical. However, our instrument did not take into account the perceived distance caused by governing structures, an issue which is also considered relevant when pondering netsourcing advantages.

The frequency of software and contract adaptations and the cost associated with these adaptations played a role in the trade-off between production cost and transaction cost. In this context, we found that adaptations occurred less frequently in companies that netsourced compared to those that did not. Transaction uncertainty also had an influence on transaction cost. Incorporating imperfect and costly control mechanisms it was found to be less important to netsourcing companies compared to ones not netsourcing.

Overall, transaction costs for searching, managing, and controlling the sourcing relationship may outweigh production cost savings of. The trade-off is determined by (1) the degree to which the software application and the required personnel are company-specific, (2) the necessary frequency of software adaptation as laid out in the contract, and (3) the perceived level of uncertainty the netsourcing relationship yields.

6. Lessons Learned and Managerial Implications

- **Strategic value** of a software application presents a determinant to netsourcing. From a strategic management perspective the application's suitability for netsourcing can merely be determined by evaluating its strategic value, but cannot be influenced by either party. This holds several managerial implications:

> → Internal ranking of applications according to their strategic value and comparing own applications to ones operated by competitors (benchmarking) is needed. If such an analysis yields either strategic relevance of an application, or strategic vulnerability caused by an application, or a combination of both, the application's strategic value is established and caution about netsourcing seems appropriate.

> → Netsourcing service providers should assist the benchmarking process by providing the sourcing company with industry data and consulting efforts.

- **Asset specificity** as a whole has divergent effects on netsourcing. On the one hand the requirement of company-specific process know-how and the presence of individually developed and maintained software applications both act as determinants of netsourcing. On the other hand the hosting location does not serve as a good indicator for netsourcing suitability; neither signals remote hosting appropriateness, nor points in-house hosting at inappropriateness of netsourcing. This holds the following implications for managers:

> → The need of company-specific know-how for development or maintenance is not a matter of influence by any party involved. So, besides identifying such applications, neither the sourcing company, nor the service provider can enhance the suitability of an application for netsourcing.

> → Service providers should be taken into consideration regardless of their location. Netsourcing from offshore locations, for instance along the silk road or the amber road, becomes attractive. Especially in the eBusiness era, offerings from economically emerging regions may offer production cost advantages which outweigh transaction costs.

- **Transaction frequency** depicting adaptations to an inter-organizational business process poses an important transaction cost determinant. Therefore, a high frequency of adaptations in the past should be an indicator to reconsider netsourcing. Transaction frequency can cooperatively be influenced by both parties. For managers this means:

> → Adaptations to applications and the underlying service agreements should be designed and clearly outlined as standard processes at the initiation stage of the project. Thus service providers and the netsourcing organization could avoid cost explosions due to non-standardized adaptation procedures.

- **Transaction uncertainty,** due to imperfect control mechanisms, externally imposes an inhibiting influence on netsourcing. While applications with easily measurable results can be considered for netsourcing, those suffering from complex and indirect measures ought to be handled with care. Transaction uncertainty can be reduced if both parties, i.e., the sourcing company and the service provider, cooperate. Specifically, this implies for the service management:

> → Reporting tools and further cooperative control mechanisms should be installed from the beginning of the project.

> → Service agreements should contain incentive structures that pay tribute to the uncertainty and help avoid performance shortfalls due to moral hazard.

7.   Limitations

We only took a first step towards a comprehensive netsourcing model. In this first step we closely aligned the components of our model with the literature on full outsourcing. The operationalization of the independent variables did not take account of the

heterogeneity among software applications, reaching from word processors to complex and customized ERP or CRM applications.

The data points did not follow the shape of a normal distribution. However, as samples exceed 15 cases, Moore (1995) indicates that the sample only needs to approximately follow normal distribution. For samples containing more than 40 cases, normal distribution is not at all required for enhancing the test's reliability. Our survey resulted in 88 questionnaires. The smaller sub sample of those not netsourcing counted 34 cases. Therefore, in our view, a small reliability concern must be mentioned, but is methodologically acceptable, even though a larger sample would assure an increased reliability.

8.   Summary and Research Outlook

In the eBusiness age, netsourcing has emerged as a phenomenon of selectively outsourcing single software applications via the Internet. Using determinants from strategic management and TCE relevant to full IT outsourcing, we investigated whether they were equally relevant in the netsourcing context. The research framework contained two independent variables from strategic management and five independent variables from TCE. We applied mean comparison analyses on data from a survey conducted among a sample of the 500 largest German companies to test seven netsourcing hypotheses.

We found both strategic management determinants and four of five TCE determinants to be significantly different between companies that netsource and those that do not. Hence, we conclude that six determinants play a major role in netsourcing decisions.

Further research should (1) investigate small and medium-sized enterprises (SMEs), (2) add determinants to the research framework, or (3) fine-tune the dependent netsourcing construct.

Broadening netsourcing research to SMEs should further extend the findings beyond large companies and thereby allow for better generalizability.

Digging deeper into the theoretical basis of outsourcing and enhanced qualitative research could lead researchers to add determinants to the research framework.

Finally, applying performance measures as dependent variables instead of managers' assessments could fine-tune the construct 'netsourcing decision'. It would allow for more objective evaluations. However, respondents providing a posterior evaluation of the determinants might cause a respondent bias: Respondents may attempt to justify 'poor' performance with misleading reports on parameter values.

Overall, in spite of those opportunities to further extend the scientific netsourcing research, we think that our findings so far offer valuable recommendations for practitioners who ask which determinants are relevant in the context of netsourcing decisions.

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