MANAGEMENT CONTROL OF SUPPORT SERVICES: THE CASE OF IT SOURCING

Eric la Lau
Michel A. van der Laan
Anne-Marie Kruis
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Abstract
This paper provides evidence on the factors that influence the design of the control arrangements that govern support services. Based on TCE, we hypothesize that control structure choices depend on asset specificity, uncertainty, and frequency. Using survey data on IT sourcing decisions from 89 firms in the construction industry, we find support for most of our hypotheses. Our results indicate that asset specificity negatively affects firms' propensity to outsource, and that (behavioural) uncertainty intensifies this negative effect. As expected, we also find that frequency has a negative direct effect on the willingness to outsource IT services provision. However, we find no support for the hypothesized interaction between asset specificity and frequency.

Keywords
support services; sourcing decisions, information technology, transaction cost economics

Address of correspondence
Roland F. Speklé
Nyenrode Business Universiteit
P.O. Box 130, 3620 AC Breukelen, The Netherlands
E-mail: r.spekle@nyenrode.nl
Phone: (+31) 346 – 291255
1. Introduction

Support services such as accounting, cash management, and IT typically account for a significant part of a firm’s total costs, and control of the support function has been a serious issue in practice for well over 15 years now. In this period, the management and control of support services seem to have changed quite dramatically. Traditionally, most support services were obtained from dedicated staff departments located either at head-quarters, or locally at the business unit level. Nowadays, many organizations have formed shared service centres, or have outsourced the support services to outside providers. Given these changes in practice, it is remarkable that the control of support services supply has received relatively little attention in the academic management accounting and control literature. There are of course exceptions. For instance, Nicholson, Jones & Espenlaub (2006) explore control issues that arise around vendor-client relationships in offshore accounting and finance services supply. Langfield-Smith and Smith (2003) study the governance arrangement between an electricity company and its outsourced IT operations. And Widener & Selto (1999) and Speklé, Van Elten & Kruis (2007) examine sourcing decisions regarding the internal audit function. But this literature is still comparatively small, and as of yet, there is little empirical evidence on the antecedents of support services related control choices, and how they depend on the organizational context and characteristics of these services.

The primary aim of this paper is to contribute some evidence-based insights into the factors that influence the control structures that govern support services supply. Specifically, we study IT sourcing decisions in construction firms1 as our vehicle to address this issue. Because firms in the construction industry are not particularly IT intensive, and IT—although quite important for the functioning of the organization—is not a prime source of competitive advantage in this industry, this empirical set-up ensures a strict focus on non-core business related services, closely matching the main aim of our study. Although

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1 Our sample is taken from the population of firms engaged in SIC division C activities. This includes three broad types of construction activity: (1) building construction by general contractors or by operative builders; (2) heavy construction other than building by general contractors and special trade contractors; and (3) construction activity by other special trade contractors. For sake of brevity, we refer to these firms as construction firms, and to their industry as the construction industry.
this single industry-single service setting may limit the generalizability of the findings, we
nevertheless believe that this empirical site is instructive, and may suggest factors, ideas
and insights with potentially broader relevance. We work from a Transaction Cost
(TCE) has quite some history in the study of governance structure choice, and its empiri-
cal credibility is comparatively good (cf. Boerner & Macher, 2002; David & Han, 2004
for reviews of the empirical literature).

Concentrating on IT sourcing decisions, our study also contributes to the information
management and systems literature. Within this area of research, several papers have
addressed the question as to when and why organizations choose to internalize the IT
function, and when and why they prefer third party procurement (see Gonzales, Gasco &
Llopis, 2006, for a recent overview). However, unlike our study, this literature is not
specifically interested in IT as a non-core support function. Rather, the papers in this
stream of literature either explicitly examine strategic IT of the core business kind (e.g.
Ang & Straub, 1998, who study the IT sourcing decision within the banking industry\(^2\)),
or investigate sourcing behaviour in broad samples that include firms for which IT is
strategically important (e.g. Aubert, Rivard & Patry, 2003; Barthélémy and Geyer, 2005;
Hall & Liedtka, 2005; Loh & Venkatraman, 1992; Tiwana & Bush, 2007). Only one of
these studies controls for IT intensity in the empirical analysis (i.e. Barthélémy and
Geyer, 2005). With its exclusive focus on non-core IT, our study complements this prior
literature.

Finally, our paper seeks to add to the empirical TCE literature. We are certainly not the
first to apply TCE to IT governance decisions. A similar theoretical orientation is for
instance present in the work of Ang & Straub (1998), Aubert et al. (2003), Barthélémy
and Geyer (2005), Langfield-Smith & Smith (2003), Miranda & Kim (2006), and Tiwana
& Bush (2007). The results of these studies, however, are inconsistent, especially with
regard to the effects of asset specificity. Barthélémy and Geyer (2005) find support for
the hypothesized effect of asset specificity. The findings of Aubert et al. (2003) are
inconclusive, whereas Tiwana & Bush (2007) report non-significant results for asset

\(^2\) We once heard a bank executive refer to his bank as an IT-firm with some side-line projects in finance
and investments.
specificity. And Miranda & Kim (2006) find a significant result for asset specificity, but in the opposite direction. This inconsistent evidence is somewhat disturbing, considering that asset specificity is in fact TCE’s epitomic variable. A problem with these studies is, however, that their operationalization of asset specificity is debatable. For example, Tiwana & Bush (2007) equate asset specificity with strategic importance. We acknowledge that broadly speaking, IT of high strategic importance is likely to be highly specific. But the reverse is not generally true. Asset specificity not only arises because of strategic importance, but also from the differential need to adapt the services to the individual circumstances of the organization, and from the intensity of the need to coordinate the service supply with the rest of the organization. Therefore, it is entirely possible for non-core IT services to be highly specific. Other studies (e.g. Aubert et al., 2003; Miranda & Kim, 2006) measure asset specificity predominantly on technological dimensions, whereas in the case of IT support services, the organizational dimension (e.g. coordination needs) is probably more important. Another problem with the prior literature is that the models do not fully reflect TCE’s basic explanatory structure. Williamson argues that both uncertainty and frequency (see sections 2.2 and 2.3, respectively) are moderating variables that influence the effect of asset specificity on the make-or-buy decision (cf. also Boerner & Macher, 2002, and David & Han, 2004). The previous IT sourcing studies of which we are aware only model the direct effects of these two variables on governance structure choice. In our study, we address both the measurement problem and the model specification issue. Thus, our model includes the relevant interaction terms, and we measure asset specificity with due reference to the organizational embeddedness of the IT service needs.

Based on survey data collected from 89 firms in the construction industry, we find that asset specificity negatively impacts the decision to outsource IT activities, and that uncertainty intensifies this effect. These findings are consistent with our hypotheses. Contrary to our expectations, however, we only find a (negative) direct effect of fre-

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3 We develop this assertion further in section 2.1 and test it in section 4.3.

4 The only (partial) exception is Ang & Straub (1998). Unlike most other studies in the TCE tradition, they do not attempt to measure the attributes of the transaction (i.e. asset specificity, uncertainty, and frequency) separately. Instead, they seek to measure (perceived) transaction costs directly. Their transaction cost variable seems to capture the combined effect of asset specificity and uncertainty (but ignores frequency).
quency on the propensity to outsource. Frequency does not seem to moderate the association between asset specificity and the willingness to outsource, contradicting our hypothesis to that effect.

The remainder of this paper is structured as follows. Section 2 uses TCE to develop the hypotheses. Section 3 describes the research design and operationalizes the theoretical constructs. Section 4 presents the quantitative analysis. The final section provides conclusions and discusses this study’s limitations, implications, and suggestions for further research.
2. Theory and hypotheses

Make-or-buy decisions involve an examination of production cost differences between internal and external procurement. To this production cost analysis, TCE adds an explicit consideration of the differential costs of contracting. TCE addresses sourcing decisions as a choice between two alternative modes of governance. These alternative governance structures differ in the control mechanisms they employ to safeguard contract execution. In-house provision of IT services subjects these activities to hierarchical control, which is based on managerial authority, internal incentive structures, and supervision. Outsourcing on the other hand implies reliance on market discipline, albeit with additional contractual safeguards. Both alternative modes of governance have a unique, distinct problem-solving potential. The alternatives also differ in respect of transaction costs. Transaction costs include the costs of drafting, negotiating, and safeguarding the transaction, but also the (opportunity) cost of performance losses due to imperfect control. TCE predicts that economic agents adopt governance structures that match their control needs in a cost-effective way. These control needs arise from two characteristics of human behaviour: bounded rationality and opportunism. Bounded rationality refers to man’s limited cognitive and computational ability. Opportunism is “self-interest seeking with guile” (Williamson, 1985: 47). The control needs also depend on the attributes of the transaction, i.e. on asset specificity, uncertainty, and frequency. Specific assets are resources that are more valuable in their current use than in alternative uses. Asset specificity indicates the presence and size of the opportunity losses that arise if the investments made to support the transaction are to be put to alternative uses or users. Uncertainty refers to the degree of ex ante specifiability of intended performance and the predictability of the environment within which the contract is to be executed (environmental uncertainty), and to the problems contracting parties experience in monitoring and evaluating the quality of performance (behavioural uncertainty). Frequency represents the volume and value of the transactions over time. TCE’s main idea is that “transactions, which differ in their attributes, are aligned with governance structures, which differ in their cost and competence, so as to effect an economizing result” (Williamson, 1999: 1090-1091).
2.1 Asset specificity

Asset specificity is associated with differentiated products, services, or processes. It is present if there is no equally attractive alternative for a given means to achieve a given purpose (Nooteboom, 1993: 443). The willingness to invest in specific assets is related to the value of differentiation to the firm, net of cost differentials of both a production and transaction cost nature. The relevance of asset specificity to matters of governance structure choice is that it gives rise to a dependency relation between buyer and seller, which can be exploited at the expense of the other party to the exchange. It is true by definition that the value of specific investments is larger in the specific exchange relationship in which they are made than in other contexts. The economic costs of these investments, therefore, can only be recovered in that particular relationship. Then, parties to such a transaction become vulnerable to opportunistic expropriation by the other party (e.g. reneging on promises, shirking on effort or quality, underinvesting in client-specific knowledge), and are only willing to engage in the transaction if they can secure sufficient protection against such behaviour. In market governance, the exit option is the core device to constrain opportunism. This option, however, soon becomes too costly in conditions of asset specificity, for exiting the relationship would leave parties with an unrecoverable loss of productive value. A solution could be to write a legally binding contract, meticulously specifying parties’ responsibilities, rights and obligations. Such contracts, however, are inevitably incomplete because of bounded rationality, and if the potential opportunity losses associated with opportunism are large, hierarchical governance becomes the structure of choice. In the hierarchy, both the supplier and the seller become employees of the same firm. In that situation, the distribution of the net value of the transaction between the buyer and the seller is less contentious, because individual compensation in the hierarchy is typically only indirectly connected to the outcomes of internal transactions. This removes much of the incentive to haggle over the distribution of the costs and proceeds, and parties can now focus on finding cooperative solutions to support a joint maximizing result. The hierarchical solution comes at a cost, though. Whereas internalization offers better possibilities to induce cooperative, adaptive behaviour, market-mediated exchange provides stronger incentives and incurs less bureaucratic costs. The trade-off depends to a large extent on asset specificity. If asset specificity is
low, market governance is efficient. But with higher degrees of asset specificity, internalization becomes increasingly attractive.

In the present study, we examine IT sourcing behaviour in the construction industry. Firms in this industry are not particularly IT intensive, and IT—although quite important for the functioning of the organization—is not a prime source of competitive advantage in this industry. Construction firms (and other non-IT intensive firms) typically use off-the-shelf IT applications, and the IT services they consume are relatively standardized and homogenous. Although some tailoring to firm-specific needs can be observed, this is usually achieved through a modular design of the software and service packages, allowing firms to adjust their IT to fit individual requirements. Also, the supply side of the market for IT-services and applications is well-developed, and there is significant competition between alternative suppliers. Nevertheless, asset specificity may be a concern. Even though firms can initially choose from a number of qualified suppliers, lock-in effects occur once they have chosen a particular supplier. This has to do with limited compatibility. Although suppliers offer broadly equivalent IT-solutions, their modules cannot easily be integrated in the platforms of their competitors. Also, maintenance of existing platforms is to some extent vendor-specific. But more interestingly for the purposes of this study is that construction firms differ in the extent to which they have integrated IT in the business operations and management of their organization. Some merely use word processing and simple bookkeeping software, whereas others use much more sophisticated ERP packages, CAD applications, project planning tools, and the like. In the latter group of firms, the IT supplier needs to coordinate its activities much more intensively with the rest of the organization, and it needs to adapt its services to organization-specific circumstances and considerations. This may require substantial investments on the side of the IT function in a firm-specific knowledge base, spanning the client’s operations, strategies, and information requirements. This knowledge, however, is only valuable within the context of the firm to which it relates, and the costs associated with its acquisition can only be recovered in that particular context.

If IT services provision requires relatively deep knowledge of the business and the company, firms are more likely to internalize the IT function. In this situation, potential external providers can only be persuaded to make the client-specific investments if they...
can secure a long term contract that allows them to recover their initial investments. Writing such contracts, however, is problematic because that requires firms to specify up front the properties of the IT services they desire over longer periods of time. In addition, firms would need to be able to explicate the necessary investments in firm-specific knowledge in legally enforceable terms, and would need to be able to assess whether their contracting partner actually makes these investments. If, on the other hand, IT services require no significant investments in firm-specific assets, market-mediated procurement is likely to be the more efficient alternative. Market exchange provides strong performance incentives, while reputation concerns in the market for IT services serve as a low-cost quality safeguard. Therefore:

**H1:** Asset specificity is negatively associated with the degree of outsourcing.

### 2.2 Uncertainty

Uncertainty is the second main factor to drive governance design. The influence of uncertainty, however, is not direct. Rather, TCE posits an interaction effect: uncertainty moderates the relation between asset specificity and governance choice. This point needs some emphasis, because many empirical studies in the TCE tradition have (mistakenly) hypothesized direct effects only, disregarding the interaction terms (cf. Boerner & Macher, 2002; David & Han, 2004).

Uncertainty may arise from various sources. It can have technological causes or be rooted in external conditions (i.e. environmental uncertainty). But it can also have behavioural origins (i.e. behavioural uncertainty). In the context of the present study, we focus on the effects of behavioural uncertainty. Given our research design, environmental and technological uncertainty is not a major source of variance. Since ours is a single industry, single country study, our respondents experience roughly the same economic conditions, and they are exposed to broadly similar environmental uncertainty. Also, the construction sector is mature and relatively stable. The same goes for IT in this sector. IT services and applications to support the construction business are well-developed by now, and inno-
vation is slow and incremental. For these reasons, it seems safe to ignore environmental and technological uncertainty as a potential influence on sourcing decisions in this study\(^5\).

We cannot, however, exclude behavioural uncertainty. Behavioural uncertainty is associated with strategic nondisclosure, manipulation of information, and –more generally– moral hazard and information asymmetry. Williamson uses the notion of ‘information impactedness’ to refer to behavioural uncertainty. He conceptualizes information impactedness as a derivative condition that arises mainly from uncertainty and opportunism (Williamson, 1975). Parties to an exchange may possess or acquire private information that is relevant to contract execution or to the assessment of performance. Such private information may be exploited at the expense of the other party. If asset specificity is low, competitive pressure effectively curbs opportunistic inclinations, and behavioural uncertainty is not a problem. With higher degrees of asset specificity, however, behavioural uncertainty poses serious contracting hazards.

In the case of IT services provision, such hazards are quite real. At least to some extent, IT is a specialist function, requiring specialized skills and competencies. Therefore, non-expert principals may find it difficult to specify desired performance in sufficiently strict, unambiguous terms, adding to the incompleteness of the IT services contract. But the specialist nature of IT also reduces the observability and verifiability of performance, allowing IT personnel to shirk on effort and quality.

In conditions of non-trivial asset specificity, TCE predicts that higher behavioural uncertainty increases the attractiveness of internalization. Internal organization brings better monitoring, enhancing observability of effort and performance quality. Also, internal organization weakens incentive intensity. This dilutes the incentive to perform well, but it also alleviates the problem of opportunism (Williamson, 1975). Thus, TCE’s position is that behavioural uncertainty reinforces the effect of asset specificity: when asset specificity is present to a non-trivial degree, uncertainty tilts the balance in favour of internalization at lower levels of asset specificity than would otherwise be required to

\(^5\) Obviously, it would be best to include environmental and technological uncertainty anyway –just to make sure. However, given the limited size of our sample (\(n = 89\); see section 3), parsimony is of particular concern to us.
result in a preference for in-house sourcing. And conversely, if asset specificity is low, higher uncertainty strengthens the motivation to outsource. Therefore:

H2: The effect of asset specificity on the degree of outsourcing is moderated by behavioural uncertainty. If uncertainty increases, the association between asset specificity and outsourcing becomes more negative.

2.3 Frequency

TCE submits that governance structures are aligned with transactions in a discriminating, transaction cost economizing way. There are, however, set-up costs involved in matching the structure to the transaction. These costs must be weighted against the benefits of better governance. Frequency refers to the volume and value of a particular transaction over time, and affects the economic rationality of investing in specialized governance. As recurrent and more valuable transactions provide a larger basis against which to charge the extra costs of specialized governance (Williamson, 1985), higher frequency supports the emergence of tailored control. This argument implies that as frequency rises, firms develop a preference for in-house sourcing at lower levels of asset specificity than would otherwise be required to tilt the balance in favour of internalization. Or to approach the issue from the opposite angle: frequency considerations may keep companies from internalizing the IT services even if they would prefer to do so because of high asset specificity. In-house provision of IT services requires firms to invest in IT expertise. Such investments carry significant economies of scale, and the demand for IT services must be sufficiently large to be able to recover the investments. In line with this reasoning, we expect the intensity of IT services consumption to interact with asset specificity, affecting IT sourcing decisions. More specifically:

H3: The effect of asset specificity on the degree of outsourcing is moderated by frequency. If frequency increases, the association between asset specificity and outsourcing becomes more negative.

We also hypothesize that frequency has a direct effect on the sourcing decision. In this way, we proxy for production cost differences between internal and external service provision. External service providers may have a production cost advantage because of
their scale. However, as the volume of IT services consumption increases, differences in production costs between internally and externally sourced IT services diminish, because larger internal IT departments may equal external suppliers in their ability to capitalize on economies of scale. Therefore:

**H4:** Frequency is negatively associated with the degree of outsourcing.

### 2.4 The theoretical model

Figure 1 visualizes the relations in the theoretical model.

[TAKE IN FIGURE 1 ABOUT HERE]
3. Research design and measurement of variables

3.1 Research design and sample

This study is based on survey data. In developing the questionnaire, we relied as far as possible on instruments validated in previous studies. Also, we pre-tested the survey instruments by asking three IT-managers and one IT-consultant to examine the questionnaire and to share their experiences, comments, and suggestions with us. This led to some minor adjustments in the survey. A summary of the survey instrument is reproduced in the appendix.

The final survey was mailed to the CFOs of 594 construction firms headquartered in the Netherlands with at least 100 employees. These firms and their CFOs were identified by combining the relevant data from two commercial databases (Marktselectonline and Companyinfo). These two databases should cover approximately the entire population of Dutch firms in the construction industry. Two weeks after the initial mailing, we sent a written reminder asking the non-respondents for their cooperation, followed by a telephone call four weeks after the initial mailing. The telephone calls were followed up by another written reminder two weeks later. These efforts resulted in 94 responses (15.8%) of which 89 are useable (15%). This response rate is not particularly high, but it is comparable to other studies in this area of research. The 89 useable responses include 7 firms with less than 100 employees. The original minimum of 100 employees was somewhat arbitrarily chosen to ensure that firms in the sample are large enough to be confronted with IT governance choices. We chose to retain the smaller firms in the analysis, believing that they were still large enough to be interesting for the purposes of our study (all employ at least 80 people).

3.2 Measurement of variables

The dependent variable is the proportion of outsourcing of IT services (PROP OUT). Scores for this variable are calculated by dividing the number of hours of outsourced IT by the total IT consumption, defined as the sum of outsourced and internally provided IT service hours.
In section 2.1, we argued that in the construction industry, asset specificity (AS) originates primarily from the extent to which IT is integrated in the business operations and management of the user firm. Consistent with this argument, we seek to measure asset specificity with seven questionnaire items addressing various aspects of the organizational role of IT, and its contribution to the functioning of the firm. Examples are the required degree of interaction with management, and the contribution of IT to business process improvement and the achievement of strategic goals (see the appendix for a full description of the relevant parts of the survey). The items are based on an instrument developed by Widener & Selto (1999) in the context of internal auditing sourcing, which we adapted to fit the purposes and setting of the current study. Respondents answered these questions for both internalized and outsourced activities, and we calculate the overall firm-level score per item by weighting the individual responses with the proportion of internalized and outsourced services, respectively. Confirmatory factor analysis shows that all seven items load on one factor. Therefore, we average the items to obtain a single, composite score for asset specificity. With a Cronbach’s $\alpha$ of 0.771, the reliability of this scale is relatively good. Table 1 provides further detail.

[TAKE IN TABLE 1 ABOUT HERE]

Behavioural uncertainty (BUNC) is based on a single question, asking the respondent to indicate the extent to which he or she is able to evaluate the quality of the IT services, irrespective of whether they are internally or externally provided. BUNC is measured by taking the reverse of the respondents’ answers. We acknowledge that it is problematic to measure a complex construct like behavioural uncertainty with only one indicator. However, our survey provides additional information to support this metric. We also asked our respondents whether they are able positively to assess the contractual performance of their external IT supplier. This question is only relevant for firms that actually outsource (part of) their IT services needs, and since our sample contains 12 firms that have fully internalized IT, we cannot use this information to construct a sample-spanning measure for behavioural uncertainty. We can, however, use these data to learn more about the quality of our single-item proxy. If we run a factor analysis on both BUNC-

6 The Widener & Selto instrument has also been used by Speklé, Van Elten & Kruis (2007) in their internal auditing sourcing study.
related items for the sub-sample of firms that rely at least in part on external IT services provision \((n = 77)\), we observe that both items load quite heavily on a single factor (factor loadings are 0.879). The Cronbach’s \(\alpha\) for this composite variable is 0.703. The correlation between our proxy and the composite measure is 0.885 and highly significant \((p < 0.001)\). These statistics suggest that the single-item measure is at least informative of behavioural uncertainty.

Frequency (FREQ) expresses the volume and value of IT services over time. We proxy for this variable by taking the natural log of the number of IT work stations. To validate this measure, we examine the bivariate correlations between the number of work stations, the number of employees, and the yearly consumption of IT services (in hours). As expected, these correlations are very high (all \(r > 0.8\)), suggesting that our measure is a valid proxy for frequency\(^7\).

\(^7\) We did consider to proxy for frequency with a composite measure including all three indicators. The resulting variable, however, would be severely skewed, even after several alternative log transformations.
4. Results

4.1 Descriptive statistics

Table 2, panel A presents descriptive statistics for each variable. This panel also includes some additional information on the respondent firms’ characteristics and IT. Panel B of table 2 gives the correlation matrix. We observe significant negative correlations between the proportion of outsourcing on the one hand, and both asset specificity and frequency on the other. The correlations between the independent variables are low and indicate no multicollinearity issues (see also footnote 8).

4.2 Modelling issues

The dependent variable in this study is the proportion of outsourcing. This variable is bounded at 0 and 1. In our data, we observe some clustering at the left side of the distribution: our sample includes 12 firms that fully rely on internal IT services provision. On the other side of the spectrum, we find one firm that sources all its IT services from external suppliers. A total of 76 firms have adopted a mixed sourcing strategy, partly relying on external providers, but performing other parts of their IT activities internally. Given that the dependent variable is censored, and given the particular distribution of observed sourcing behaviour, we test the hypotheses using TOBIT regression. This TOBIT analysis simultaneously estimates the chance that a particular firm will outsource part of its IT, and if it does, how much. In this analysis, we use White heteroskedasticity-consistent standard errors and covariance to correct for possible heteroskedasticity.

Apart from the variables predicted to have a direct effect on outsourcing (asset specificity and frequency), the model takes in two multiplicative terms to capture the interaction of both behavioural uncertainty and frequency with asset specificity (H2 and H3, respectively). Including product terms in the model potentially introduces multicollinearity. To address this potential problem, we standardize the relevant variables prior to forming the
multiplicative terms (cf. Aiken & West, 1991; Jaccard, Turrisi & Wan, 1990)\textsuperscript{8}. The model also tests for a direct effect of behavioural uncertainty. Although this main effect is not grounded in theoretical TCE (as argued in section 2.2, TCE posits that uncertainty is only relevant in conjunction with asset specificity; not in isolation), it must be included in the regression equation to verify that a significant coefficient for an interaction effect is not in fact due to lower order effects (cf. Echambadi, Campbell & Agerwal, 2006; Hartmann & Moers, 1999).

4.3 Results

Table 3 reports the results of the regression. The McKelvey-Zavoina statistic (in the TOBIT-consistent version of Veall & Zimmermann, 1994) indicates that the model explains almost 30% of the variance in outsourced IT services. The McKelvey-Zavoina statistic is a pseudo-$R^2$ measure comparable to the familiar $R^2$ from OLS-regression (Veall & Zimmermann, 1994; 1996).

[TAKE IN TABLE 3 ABOUT HERE]

The results provide substantial support for H1, H2, and H4, but not for H3. Consistent with H1, we find that asset specificity is significantly and negatively associated with the degree of outsourcing ($p = 0.0440$, two-tailed). We also find that frequency is negatively associated with IT outsourcing, as predicted in H4 ($p = 0.0011$, two-tailed). Finally, we find support for H2, stating that the effect of asset specificity on the degree of outsourcing becomes more negative when behavioural uncertainty rises ($p = 0.0079$, two-tailed). There is no direct effect in the data of behavioural uncertainty on the propensity to outsource. The hypothesis on the moderating effect of frequency on asset specificity (H3) is not supported. Given the modest size of our sample, it is not impossible that this interaction effect does in fact exist. In small samples, it is quite easy to overlook interac-

\textsuperscript{8} We are aware that the general soundness of this standard advice is not uncontroversial, and that a growing literature argues that mean centring (or standardizing) does not affect collinearity (see for instance Echambadi et al., 2006; Echambadi & Hess, 2007; Gatignon & Vosgerau, 2005). An analysis of variance inflation factors (although an imperfect indicator of collinearity) does not reveal any reason for concern: all VIFs in our model are below 1.5.
tion effects, especially when individual predictors are susceptible to measurement error (Cohen, Cohen, West & Aiken, 2003). This chance, however, is remote considering the low z-value we find \((z = 0.48)\).

Our dataset also contains information on the technological specificity of the IT function, allowing us to construct an alternative measure for asset specificity. This alternative measure emphasizes the technological dimension of IT, which has been the focus of most of the previous information management and systems literature (see section 1). In a series of four survey questions, we asked the respondents to indicate the extent to which their IT infrastructure, application and work station management, and telecommunication software require investment in specialized, organization-specific resources. The four questionnaire items load on a single factor (factor analysis details not reported), and the reliability of the composite variable based on these items is good (Cronbach’s \(\alpha = 0.868\)).

In section 1, we asserted that the explanatory relevance of technological specificity is low compared to the specificity that derives from the organizational embeddedness of the IT function. To examine this assertion, we rerun the analysis, now including technological specificity in the model. Consistent with our claim, the results of this additional analysis (not tabulated) show that technological specificity has no effect on IT sourcing behaviour, while we still find support for H1, H2, and H4.
5. Conclusions and discussion

In this paper, we provide evidence on the factors that influence the design of the control arrangements that govern support services. Concentrating on the provision of IT services in the construction industry, this paper is one of the few quantitative studies in the management accounting and control literature that address the control of non-core activities. Based on TCE, we hypothesized that control structure choices depend on asset specificity, uncertainty, and frequency. Using survey data from 89 individual firms, we found support for most of our hypotheses. Our results indicate that asset specificity negatively affects firms’ propensity to outsource, and that (behavioural) uncertainty intensifies this negative effect. As expected, we also found that frequency has a negative direct effect on the willingness to outsource IT services provision. However, we found no support for the hypothesized interaction between asset specificity and frequency.

These findings suggest that production cost considerations are important in sourcing decisions. That is, we found that smaller firms are more likely to outsource their IT services supply, presumably because these smaller firms cannot achieve a cost-effective scale of in-house IT operations. Larger firms on the other hand are able to realize economies of scale, allowing them to match external suppliers in respect of production cost. The results furthermore indicate that sourcing preferences depend on the organizational role of the IT function, i.e. on the extent to which firms have integrated IT in their core business. We found that firms that rely on IT more intensively in the management of their business operations are more likely to internalize IT supply. Consistent with TCE reasoning, this finding suggests that in-house provision of the services facilitates coordination and adaptation to organization-specific circumstances and considerations. Interestingly, technologically driven asset specificity has no effect on the sourcing decision, lending support to the assertion that the inconsistent results as to the impact of asset specificity in previous IT sourcing studies might be caused by operationalization issues. We also found that the conditional preference for insourcing is reinforced by the difficulties principals experience in monitoring the quality of the services. This finding is also consistent with TCE, which predicts that when performance is difficult to observe and to verify, firms prefer the hierarchical mode of governance with its richer monitoring repertoire and weaker incentives.
This study has several limitations that should be recognized when interpreting our evidence. This paper reports on a single service-single industry study. This research design limits the (statistical) generalizability of the results. Also, given the complexity of the model, the size of our sample is relatively small. A larger sample size would have allowed an examination of additional factors that may be relevant in explaining IT sourcing, as for instance the effect of environmental uncertainty. Another caveat is that even though the hypotheses are built on efficiency arguments, the study does not establish the actual efficiency of observed sourcing practices. In addition, as the research design is purely cross-sectional, our study provides evidence on associations, not on causal relations. Therefore, while we found that firms behave broadly as predicted, we cannot positively conclude that their sourcing decisions are actually rooted in efficiency motives. Neither can we conclude that a theoretically consistent sourcing strategy is in fact efficient. But probably the most important limitation is that some of our independent variables are perceptual rather than ‘hard’ measures (cf. Ittner & Larcker, 2001). Perceptions may be biased, and we cannot exclude the possibility that for instance our measure for asset specificity is influenced by the sourcing practices adopted by the respondents. Thus, it is conceivable that respondents from insourcing firms feel that the IT services are more integrated in business operations, only because they are being provided by colleagues rather than by anonymous third party employees. Further research is necessary to redress the limitations of this study and to fill remaining knowledge gaps.

One avenue that could be explored in future research is whether the results of this single service-single industry study have broader relevance outside the specific domain in which it is conducted. It is at least possible that our findings have some theoretical generalizability in the sense that the factors that influence IT sourcing in the construction industry may be transposable to other sectors in which the position of IT in the business is similar. Also, and perhaps more importantly, it is conceivable that the insights from this paper have some bearing on other support services too. For instance, the finding that sourcing decisions depend on the extent to which IT is integrated in the business operations and management of the firm may very well apply to other support services (e.g. accounting or recruiting) as well.
Another potentially fertile research track involves a more detailed examination of the control arrangements. As our study concentrates on the basic make-or-buy decision, it only provides evidence on the factors that drive the high-level choice between hierarchical control versus the hybrid mode of governance. These generic forms, however, are broad classes, subsuming a variety of different specific configurations of control devices (Speklé, 2001). For instance, firms that choose to internalize a support function still have to decide on whether to organize the service supply through, for example, a shared service centre, or whether a traditional cost centre structure would be more appropriate. Although these questions have attracted some theoretical attention (e.g. Vosselman, 2002), empirical analysis is still very scarce.
Appendix
Survey instrument (abbreviated)

Proportion of outsourcing (PROP OUT)
- By *in-house man-hours* we mean hours spent on IT activities within the boundaries of the organization. In 2006, approximately how many in-house man-hours were spent on IT activities?
- By *external man-hours* we mean hours spent on IT activities outside the organization by third parties through outsourcing arrangements. In 2006, approximately how many external man-hours were spent on IT activities?

Asset specificity (AS)
- Please indicate your agreement or disagreement with the following statements (1 = strongly disagree; 5 = strongly agree).
  - In-house IT activities contribute to the firm’s image as a technologically advanced organization.
  - In-house IT activities provide feedback and prevent surprises within the organization.
  - In-house IT activities require a high degree of interaction with management.
  - In-house IT activities contribute to the achievement of strategic goals.
  - In-house IT activities contribute to the identification of process improvement potential within the organization.
  - In-house IT activities contribute to the identification of market opportunities.
  - In-house IT activities contribute to the success of the organization.
- This set of questions is repeated for outsourced IT activities.

Technological specificity
- By *tailor-made* we mean the extent to which resources or activities are especially designed to match the specific requirements of the organization, or put differently, are unique to the organization. To what extent are the following IT activities tailor-made? (1 = not at all; 5 = to a very large extent)
  - Development and maintenance of IT infrastructure.
  - Application management.
- Work station management.
- Development and maintenance of telecommunication software.

**Behavioural uncertainty (BUNC)**
- Whether you outsource IT activities or not, to what extent can you evaluate the quality of in-house and outsourced IT activities? (1 = not at all; 5 = extremely well)
- If applicable, to what extent can your organization determine if the provider of outsourced IT services performed according to contractual obligations? (1 = not at all; 5 = extremely well)

**Frequency (FREQ)**
- Please indicate the number of IT work stations in your organization in 2006.
- On average, how many employees have been working for your organization during 2006?
References


FIGURE 1
Theoretical model

- behavioural uncertainty
- asset specificity
- frequency

outsourcing of IT services
TABLE 1
Composition and reliability of asset specificity

<table>
<thead>
<tr>
<th>Items</th>
<th>Component loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td>contribution to the firm’s image as a technologically advanced organization</td>
<td>0.515</td>
</tr>
<tr>
<td>provision of feedback and prevention of surprises</td>
<td>0.518</td>
</tr>
<tr>
<td>degree of interaction with management</td>
<td>0.659</td>
</tr>
<tr>
<td>contribution to achievement of strategic goals</td>
<td>0.746</td>
</tr>
<tr>
<td>contribution to the identification of process improvement potential</td>
<td>0.738</td>
</tr>
<tr>
<td>contribution to the identification of market opportunities</td>
<td>0.633</td>
</tr>
<tr>
<td>contribution to the firm’s success</td>
<td>0.798</td>
</tr>
</tbody>
</table>

Cronbach’s alpha = 0.771
TABLE 2
Descriptive statistics and correlations

Panel A: Descriptive statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Minimum</th>
<th>Median</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROP OUT</td>
<td>0.2713</td>
<td>0.2605</td>
<td>0.00</td>
<td>0.1860</td>
<td>1.00</td>
</tr>
<tr>
<td>AS</td>
<td>3.4977</td>
<td>0.5009</td>
<td>2.07</td>
<td>3.5769</td>
<td>4.43</td>
</tr>
<tr>
<td>BUNC</td>
<td>2.5114</td>
<td>0.6947</td>
<td>2.00</td>
<td>2.0000</td>
<td>4.00</td>
</tr>
<tr>
<td>FREQ</td>
<td>4.3691</td>
<td>1.1752</td>
<td>2.08</td>
<td>4.2485</td>
<td>8.78</td>
</tr>
</tbody>
</table>

Additional descriptive statistics:

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>IT hours</td>
<td>5,760</td>
<td>13,345</td>
<td>120</td>
<td>2,000</td>
<td>83,200</td>
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<tr>
<td>Employees</td>
<td>573</td>
<td>1,993</td>
<td>80</td>
<td>180</td>
<td>18,000</td>
</tr>
<tr>
<td>Work stations</td>
<td>227</td>
<td>732</td>
<td>8</td>
<td>70</td>
<td>6,500</td>
</tr>
</tbody>
</table>

Panel B: Correlation matrix

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: PROP OUT</td>
<td>1</td>
<td>-0.249***</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2: AS</td>
<td>0.009</td>
<td>0.008</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3: BUNC</td>
<td>-0.460***</td>
<td>0.226*</td>
<td>-0.120</td>
<td>1</td>
</tr>
<tr>
<td>4: FREQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*, **, *** correlation is significant at the 0.10, 0.05, and 0.01 level, respectively (2-tailed).
TABLE 3
Results of the TOBIT analysis

Dependent Variable: PROPOUT
Method: TOBIT
Sample: 89
Included observations: 67
QML (Huber/White) standard errors & covariance

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>z-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>intercept</td>
<td>1.137569</td>
<td>0.319584</td>
<td>3.559530</td>
</tr>
<tr>
<td>AS</td>
<td>-0.165607</td>
<td>0.082213</td>
<td>-2.014369</td>
</tr>
<tr>
<td>BUNC</td>
<td>0.030672</td>
<td>0.041787</td>
<td>0.734005</td>
</tr>
<tr>
<td>FREQ</td>
<td>-0.091876</td>
<td>0.028219</td>
<td>-3.255770</td>
</tr>
<tr>
<td>ASxBUNC</td>
<td>-0.110131</td>
<td>0.041461</td>
<td>-2.656260</td>
</tr>
<tr>
<td>ASxFREQ</td>
<td>0.019526</td>
<td>0.040430</td>
<td>0.482945</td>
</tr>
</tbody>
</table>

McKelvey-Zavoina $R^2$: 0.299
Nyenrode Research and Innovation Institute (NRI)

Straatweg 25
Postbus 130, 3620 AC BREUKelen

T +31 346 291 695
F +31 346 291 250
E nri@nyenrode.nl

www.nyenrode.nl/nri