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A transaction cost theoretical analysis of software-as-a-service (SAAS)-based sourcing in SMBs and enterprises

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A TRANSACTION COST THEORETICAL ANALYSIS OF SOFTWARE-AS-A-SERVICE (SAAS)-BASED SOURCING IN SMBS AND ENTERPRISES

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Abstract

This study seeks to better understand the factors contributing to the adoption of Software as a Service (SaaS) as on-demand sourcing option. Grounded in transaction cost theory (TCT), we developed a research model for assessing SaaS-sourcing at the application level. Four hypotheses with three TCT-based constructs (application specificity, environmental uncertainty, and usage frequency) and one contingency factor (firm size) affecting the adoption of SaaS-based sourcing were formulated. Survey data of 154 firms in Europe with 284 response items across different industries were collected to test the theoretical model. PLS-based structural equation modeling demonstrated that uncertainty emerges as the strongest factor for SaaS-adoption, while application specificity also contributes significantly. Differentiating between small and medium-sized businesses (SMBs) and enterprises, uncertainty represents the strongest driver for SaaS-adoption in SMBs, whereas application specificity is more important in enterprises. Finally, firm size is significantly and negatively associated with SaaS-based sourcing within, but not across the subgroups of SMBs and enterprises.

Keywords: Software as a service (SaaS), IT outsourcing, IT adoption, SMBs and enterprises

1 INTRODUCTION

On-demand software application delivery models are known since the late 1990s and have come in many forms and varieties such as Application Service Providing (ASP) or Business Service Providing (BSP). The common denominator of all these concepts is that this kind of demand-driven application sourcing model provides users and firms with network-based access to resources and expertise as well as to an integrated portfolio of complex applications that spans the complete virtual value chain of an enterprise (Kern et al., 2002a). While discussions on ASP-based outsourcing have become rather silent in recent IS management literature mainly due to the missing breakthrough success stories, a new acronym, called Software-as-a-Service (SaaS), has gained ground in the attention span of IS executives and is said to become a fundamental pillar of revenues for IT vendors in the next couple of years (Pettey, 2006). Although often discussed as an "old wine in new skins" concept, SaaS is promised to breach last barriers of adoption, as it offers more mature and comprehensive service packages on the customer side and the ability to support service-oriented multitenancy and a shared IT infrastructure to reap significant economies of scale on the provider side (Valente & Mitra, 2007).

Traditionally, the interest in on-demand based sourcing models was driven by a focus on core competencies, the attractive cost model for customers (i.e., turning fixed costs into variable costs), the benefits from cutting-edge technology and faster implementation times, transparent and predictable subscription pricing, and the possibility to flexibly balance the shortage of necessary IT skills (Kern et al., 2002b). Countering these benefits are the acknowledged risks of reliability (how can IT departments ensure that the business can access its applications?), security (how can it guarantee data privacy in line with regulations?), and process dependence (how can it make sure that quality of service is really achieved?) when outsourcing IT applications to a 3rd party (Kern et al., 2002a). Puzzled by these mixed point-of-views, researchers and practitioners have struggled to determine

which side of the discussion will prevail over time. However, while many research and management papers have theoretically explored the meaning, characteristics, and economic implications of on-demand application outsourcing, only few have examined the drivers of SaaS-similar sourcing decisions on a substantial empirical basis, which may also be due to the immatureness of this research object. Specifically, what is missing in the existing literature is a solid and theory-based research model on the drivers of SaaS-based outsourcing which is assessed based on a broad dataset instead of a few isolated cases. Our study seeks to reduce this research gap. Key research goal of our study is to contribute to a heightened understanding in the drivers behind using SaaS-based sourcing models viewed through a transaction cost based lens. Concrete research questions are: (1) How do transaction cost based factors such as asset specificity, environmental uncertainty, and usage frequency explain the sourcing of applications via SaaS? (2) What is the role of firm size in the adoption of SaaS-based sourcing models? (3) How does SaaS-adoption look like on an application level today and in the future? Based on these questions, our research focus is not to compare SaaS-based sourcing with other types of outsourcing arrangements (e.g., licensing), but to explain why companies would agree or disagree to have their applications operated as service by an IT provider.

The following section reviews the literature from which our transaction cost theoretical framework is developed. A conceptual model and a series of research hypotheses are then formulated, followed by our research methodology, analysis, and the empirical results. The paper concludes with a discussion of findings and limitations.

2 TRANSACTION COST THEORY AND IT OUTSOURCING

Transaction cost theory (TCT) is embedded in the framework of the new institutional economics which was first introduced by Coase (Coase, 1937), who analyzed why firms exist and what firms do. One of Coase's initial propositions was that firms and markets are alternative governance structures differing in their transaction costs (Coase, 1937, p. 389) – where by transaction cost Arrow referred to the "costs of running the system" (Arrow, 1969, p. 48). Accordingly, the transaction-cost approach is based on the premise that the existence of different organizational forms, whether they are markets, bureaucracies, or clans, is primarily determined by how efficiently each form can mediate exchange transactions between parties (Ouchi, 1980, p. 130). Over the past four decades, Williamson has added considerable precision to Coase's general argument by identifying the types of exchanges that are more appropriately conducted within firm boundaries than via the market. To evaluate different governance or exchange arrangements, Williamson introduced characteristics or determinants of transaction cost differences of which asset specificity, frequency, and uncertainty are the most important ones (Williamson, 1985). In the IS research literature, transaction cost theory has particularly and comprehensively been applied in the context of IT outsourcing (e.g., Ang & Straub, 1998; Lacity & Willcocks, 1995). Wiener found in his literature synthesis on IT outsourcing that transaction cost theory has been the predominant theoretical approach to understand and explain IT outsourcing decisions (Wiener, 2006). Aubert et al. for example has investigated a transaction cost model on IT outsourcing using asset specificity, uncertainty, business and technical skills as determinants of the level of IT outsourcing (Aubert et al., 2004). Dibbern instead focused on the effect of human asset specificity on the sourcing of application services (Dibbern et al., 2005), while Loh developed an integrated governance model of IT outsourcing including various theoretical approaches (e.g., transaction cost theory and agency cost theory) to test his hypotheses (Loh, 1994). All of these studies provided consistent empirical support for the TCT framework.

Reviewing the IT outsourcing literature more closely focusing on on-demand based IT outsourcing, it is interesting to note though that drivers of on-demand outsourcing decisions have not been studied extensively so far. On the one hand, a number of theoretical research studies exist that propose definitions and classifications, and explore special characteristics (such as service quality or capabilities) of ASP-based sourcing models (e.g., Ma et al., 2005; Smith & Kumar, 2004). On the other hand, existing empirical studies very frequently limit their analysis to providing content-rich, but

less representative case studies on determinants of on-demand based IT outsourcing (e.g., Jayatilaka et al., 2003; Kern et al., 2002a). The number of research studies on the drivers of on-demand IT sourcing which are based on a solid empirical basis is thus rather small and limited to special aspects in the adoption in single countries and industries (Daylami et al., 2005). Based on these observations, the current IS literature is rather scarce on the assessment of more broadly valid and applicable adoption drivers of on-demand sourcing decisions. Drawing upon this empirical evidence, we seek to fill this research gap by examining TCT-based factors that may affect SaaS-based sourcing decisions.

3   HYPOTHESES DEVELOPMENT

Outsourcing of software applications is the handover of the development and maintenance of an application to an IT provider and is an alternative to internal development and maintenance. The essence of the transaction-cost based argument is that using an external IT vendor is not frictionless. When buying or leasing a service (such as SaaS) or a product, one incurs costs. If these costs become too high, relying on self-production is more appropriate. Transaction costs theory has two underlying assumptions. *Bounded rationality* is the inability of the human mind to find or process all the information about a transaction; therefore, it is conducted with a certain level of uncertainty. *Opportunism* is more than the simple defense of one's interest or value maximization; it is *self interest seeking with guile* (Williamson, 1989). The combination of these assumptions results in information asymmetry. In order to strike a better deal, sellers will hide negative characteristics of their products, and buyers will not reveal how much they are willing to pay. Since both parties know that the other is opportunistic, each will engage in information seeking activities (e.g., having a product tested before buying it or asking for warranties). All these actions generate transaction costs. This is especially true for SaaS-based outsourcing in which an outsourcer's handover of application data and process ownership may cause lower or higher levels of transaction costs compared to operating the application in-house. According to transaction cost theory, the factors determining the extent of transaction costs are grouped into three broad categories: (1) the specificity of the assets required for performing the transaction, (2) the uncertainty surrounding the transaction, and (3) the frequency of the transaction executed. As firm size seems to be a special factor in SaaS-based sourcing decisions due to the reasons mentioned in the introduction, it will also be included in our hypothesis development (4).

3.1   Application Specificity and SaaS-based Sourcing

Traditional transaction cost economics posit that transactions with high asset specificity (i.e., the degree to which assets can be redeployed elsewhere without losing value) are managed less expensively in-house, while the rest should be more efficiently outsourced (Williamson, 1989). Specifically, the theory suggests that when asset specificity is high, the assets involved in the transaction are so idiosyncratic and customized to the application context, that in-house production will bear lower transaction costs than outsourcing due to lower levels of so-called *post-investment opportunistic behaviour* (Klein et al., 1978). A number of prior research studies on IT outsourcing have employed asset specificity in their research models to explain outsourcing decisions with rather puzzling outcomes. While Nam et al. did not find any significant link between specificity and outsourcing (Nam et al., 1996), Aubert et al. discovered inconsistent effects of specificity (Aubert et al., 2004). On the other end, Dibbern showed that insourcing is more cost efficient and advantageous in creating strategic benefits through IS, if the provision of application services requires a high amount of firm specific human assets (Dibbern et al., 2005). In the case of SaaS-based application sourcing, application specificity is reflected in the degree that applications are customized to the individual requirements of the outsourcing company and thus comprise highly specific investments. Based on TCT thinking, it can be argued that the higher the degree of application specificity, the lower the level

of SaaS-based outsourcing, as integration and coordination costs for running a highly customized application system on the IT provider side outweigh the transaction costs for running the application in-house. These theoretical assertions lead to the following hypothesis:

H1:   Application specificity is negatively associated with SaaS-based outsourcing.

3.2   Environmental Uncertainty and SaaS-based Sourcing

Analogous to asset specificity, environmental uncertainty surrounding a specific outsourcing relationship is posited to be negatively associated with the degree of outsourcing (Williamson, 1989). By the majority, prior research on IT outsourcing has supported this theoretical proposition. For instance, Nam et al. found that uncertainty towards potential opportunistic behaviour of the IT provider played a significant role in the decision to outsource. As expected, higher uncertainty and thus higher perceived risk lead to less outsourcing (Nam et al., 1996). Similarly, Aubert et al. found in their study that the level of uncertainty is the major deterrent to outsource IT operation activities (Aubert et al., 2004). Dibbern conceptualized environmental uncertainty in the IT outsourcing context as comprising business driven and technology driven uncertainty (Dibbern, 2004, p. 53-54). While business driven uncertainty refers to the extent to which the development of business related issues (such as pricing or processes) may be changed over time in the course of the outsourcing relationship by the IT vendor, technology-driven uncertainty captures the extent to which the required technical functions or features of the outsourced application may be changed over time. Based on these notions of uncertainty, one can hypothesize for SaaS-based outsourcing that when environmental uncertainty is high due to potential opportunistic behaviour of the IT provider regarding business- or technology-related activities, the outsourcer will prefer internal governance for highly risky activities. This leads us to the following hypothesis:

H2:   Environmental uncertainty is negatively associated with SaaS-based outsourcing.

3.3   Usage Frequency and SaaS-based Sourcing

Theoretical ideas about transaction or usage frequency stem from the classical notion that an increasing number of transactions between two parties entails trust-building and routine which can be represented in a hierarchical governance form more efficiently than in a market governance form (Williamson, 1984). This is also backed up by classical organizational theory which argues that the higher the interdependence between organizational units, the higher the necessity to integrate both organizational units due to transaction cost savings (e.g., Thompson, 1967), which in turn can be attributed to routinization effects and economies of scale. Low frequency transactions with less complexity involved are thus likely to be organized through market interactions. In the context of IT outsourcing, Aubert et al. found that frequently used assets or skills in software development were used in-house, whereas infrequently and specialized assets and skills were contracted out (Aubert et al., 2004). Similarly, Hancox and Hackney synthesize from their findings in a study of private and public sector organizations that usage frequency indeed is negatively associated with the use of the market (Hancox & Hackney, 2000). Regarding SaaS-based sourcing, it can be argued that increased usage of an application system that requires different technical and human interfaces, skills and resources, as well as a high number of interactions (e.g., planning, adapting, and monitoring of task completion) will translate into increased coordination complexity between these different entities (Dibbern, 2004, p. 47-48). This will in turn induce the outsourcing decision-maker to rather opt for in- than for outsourcing due to transaction cost advantages. Hence, we can formulate the following hypothesis:

H3:   Usage frequency is negatively associated with SaaS-based outsourcing.

3.4 Firm Size and SaaS-based Sourcing

Firm size is one of the most commonly studied factors in the IS and organization literature (e.g., Gremillion, 1984). Yet, different opinions exist as to the role that firm size plays in the process of adopting new technologies and innovations. On the one hand, large firms often possess more slack resources that can increase the openness for technology experiments – the so-called Schumpeterian resource advantages (Schumpeter, 1950). On the other hand, large firms tend to be less agile than small firms. This comparatively bigger structural inertia associated with large firms may entail more effort and cost for technology adoption (Duncan, 1976). In the context of IT outsourcing, Kern et al. developed the proposition – which is informed by transaction cost and resource based theory – that small and medium-sized companies (SMBs) are especially interested in more flexible application service providing mechanisms. This is mainly due to the fact that they can get access to strategic resources which are often prohibitively costly yet essential for SMBs to remain resource competitive against larger firms (Kern et al., 2002a, p. 171). Based on this theoretical assertion and the hypothesis that large firms show higher structural inertia, we argue that firm size will be negatively related to SaaS-based sourcing and thus deduce the following hypothesis:

H4: Firm size is negatively associated with SaaS-based outsourcing.

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4 RESEARCH METHODOLOGY

4.1 Data and Sample

To test the hypotheses suggested above, we designed a questionnaire and conducted a Europe-wide survey. The survey questionnaire was designed on the basis of a comprehensive literature review in the IT outsourcing context and based on interviews with IT managers. After several rounds of pretests and revisions, the survey was distributed in the biggest 6 European countries (Germany, France, UK, France, Italy and Spain) during the period of September through December 2007. The survey was conducted at the application type level, so that one company had the possibility to rate different application systems (i.e., Collaborative, Content, ERM, Human Capital, SCM, Production, Engineering, CRM applications) on the applicability and drivers of SaaS-based outsourcing.

The questionnaires were sent to 1,200 top or senior IT executives randomly selected from a directory of 3,000 firms in the finance, manufacturing, logistics, high-tech, energy, and TIME industry supplied by a market vendor (Bisnode Business Information Group). After we dropped 18 responses due to missing data and inconsistencies, a total of 284 usable responses from 154 different companies could be used for the analysis. We tested non-response bias with chi-square tests and found no statistically significant differences between early and late respondents on firm size and SaaS outsourcing levels (Pearl & Fairley, 1985).

4.2 Operationalization of Constructs

Table 1 shows the operationalization of variables of our conceptual model. Besides one question, for which a percentage estimate on the SaaS adoption rate in 2007 and 2010 was requested, all other questions were asked from a scale ranging from 1 to 5, where 1 refers to the lowest score and 5 the highest score in the item scale. Measurement items of all variables were drawn from those of previous studies as depicted in Table 1.

Constructs	Indicators	Source
SaaS-based Sourcing (reflective)	Overall level of SaaS-based outsourcing with respect to the application	Loh, 1994
	Approximate/Estimated percentage of the application's budget allocated to SaaS-based outsourcing in 2007 and 2010	Dibbern, 2004; Teng et al., 1995
Application Specificity (reflective)	The extent to which the application is related to the individual needs of the company	Kern et al., 2002a
	The extent to which the application is customized to individual requirements of the company	
	The extent to which the application supports special processes of the company	
Environ-mental Uncertainty (reflective)	The extent to which the application outsourcing is subject to technical difficulties in terms of bandwidth and reliability	Smith & Kumar, 2004; Ma et al., 2005
	The extent to which the application outsourcing is subject to economic dependencies in terms of pricing model changes	
	The extent to which the application outsourcing is subject to process dependencies in terms of quality of service (in SLAs)	
Usage Frequency (reflective)	The extent to which the application requires interfaces to other systems in and outside the company	Smith & Kumar, 2004
	The extent to which the application is used frequently by different internal and external users	
	The extent to which the application usage requires coordination efforts (i.e., skills and resources) among users	
Firm size	Number of employees of company	e.g., Thompson, 1967

Table 1.   Measurement of Constructs

4.3   Instrument Validation

Content validity was established through the adoption of constructs that had been used in former studies (see Table 1) and through pilot tests with IS practitioners of different industries. The reflective measurement models were validated using the standard procedures of current literature (Chin, 1998; Straub, 1989). Items of scales in a related domain were pooled and factor-analyzed to assess their convergent and discriminant validity. While convergent validity was determined both at the individual indicator level and at the specified construct level, discriminant validity – the extent to which different constructs diverge from one another and thus are distinct in nature – was assessed by analyzing the average variance extracted and inter-construct correlations. The results are illustrated in Table 2.

Constructs	Number of indicators	Range of Standardized Factor Loadings*	Composite Reliability (ρ_c)	Average variance extracted (AVE)
SaaS-based Sourcing	2	0.920 – 0.941	0.928	0.865
Application specificity	3	0.797 – 0.860	0.874	0.700
Environmental uncertainty	3	0.899 – 0.957	0.944	0.849
Usage frequency	3	0.707 – 0.883	0.834	0.628
Firm size	1	1.000	1.000	1.000

* All factor loadings are significant at least at the $p < 0.05$ level

Table 2.   Assessment of Measurement Model: Factor Loadings and Reliability

All standardized factor loadings are significant, thus suggesting convergent validity (Bagozzi et al., 1991). To evaluate construct reliability, we calculated composite reliability for each construct. All constructs have a composite reliability significantly above the cutoff value of 0.70 (Hair et al., 1998). All reflective constructs also met the threshold value for the average variance extracted (AVE>0.50). For discriminant validity of latent variables, the square roots of AVEs exceeded the inter-construct correlations that were negligibly low between the independent constructs.

5 EMPIRICAL ANALYSIS

5.1 Descriptive Results on SaaS-based Outsourcing on the Application Level

We analyzed the adoption levels in terms of the percentage of an application's budget allocated to SaaS-based sourcing in 2007 and 2010. SMBs allotted around 5.7% of their IT application budget to SaaS-based outsourcing in 2007 overall and plan to spend as much as 14.8% in 2010. On the contrary, enterprises allocated only around 3.6% of their IT application budget to SaaS-based sourcing models. However, according to the results of our study, the adoption level of SaaS in enterprises will triple until 2010 to a level of around 11.1%. To gain a deeper understanding of current and future SaaS adoption, Table 3 shows the outsourcing levels of different SaaS-based applications in 2007 and 2010.

	SMBs		Large Enterprises	
Application type	Adoption level 2007	Estimated Adoption level 2010	Adoption level 2007	Estimated Adoption level 2010
Collaborative	~15%	~30%	~12%	~25%
Content Mgmt.	~2%	~7%	~1%	~4%
ERM	~2%	~4%	~1%	~2%
Human Capital	~12%	~33%	~8%	~23%
SCM	~1%	~1%	~1%	~1%
Production	~0%	~0%	~0%	~0%
Engineering	~1%	~2%	~0%	~0%
CRM	~11%	~41%	~5%	~31%
Total average (n=284)	~6%	~15%	~4%	~11%

Table 3.   SaaS-Adoption on the Application Level

Comparing the absolute adoption levels between SMBs and enterprises in 2007 and 2010 along all applications, a significant difference could be identified using t-tests (t-value$_{2007}$=3.49, p<0.001; t-value$_{2010}$=2.22, p<0.05). The implications of these descriptive results will be dealt with in the discussion section along with the following explanatory outcomes.

5.2 Analysis of the overall sample

We tested our research hypotheses with actual 2007 adoption rates by using PLS-based structural equation modelling (Chin, 1998; Lohmöller, 1989) based on SmartPLS (Ringle et al., 2005). In contrast to parameter-oriented and covariance-based structural equation modeling, the component-based PLS method is prediction oriented (Chin, 1998, p. 352). It seeks to predict the variations in the dependent variables of the model, which we want to achieve for the SaaS-based outsourcing construct in our study. Since PLS does not account for the covariances of all indicators, but only for those variances that have been specified in the model, it is closer to the actual data than the covariance-based procedure (Fornell, 1989). Due to the partial estimation of single elements in the causal model, fewer empirical cases are needed in PLS- than in covariance-based structural equation modeling to generate consistent and reliable results. To provide an aggregate view on the assessment of PLS-based models, the structural model is evaluated by looking at the percentage of the variance explained (R^2) of all

dependent latent variables. By examining the size and stability of the coefficients associated to the paths between latent variables, hypotheses, which were proposed during the model specification process, are finally analyzed for their significance. Standardized path coefficients and R^2 as major model-fit index are shown in Figure 1.
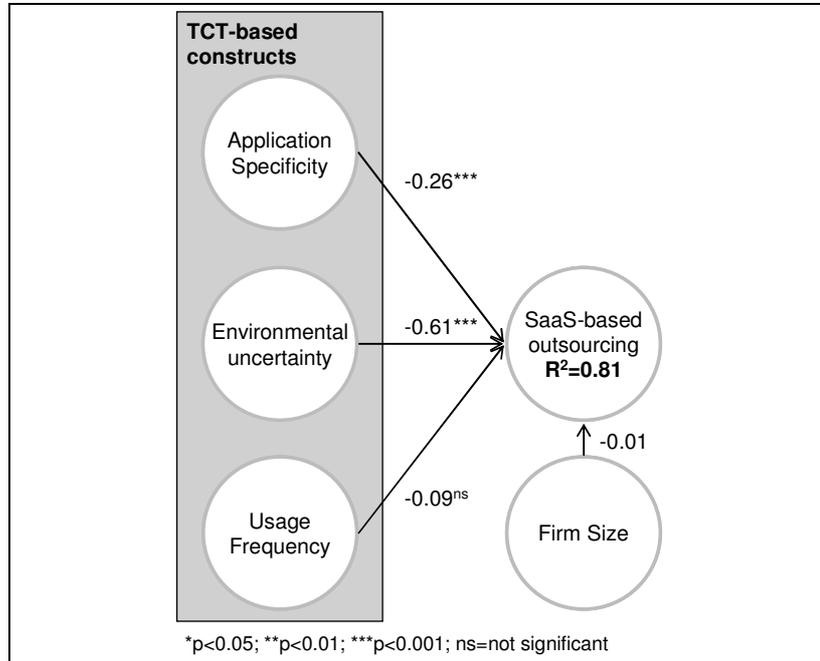

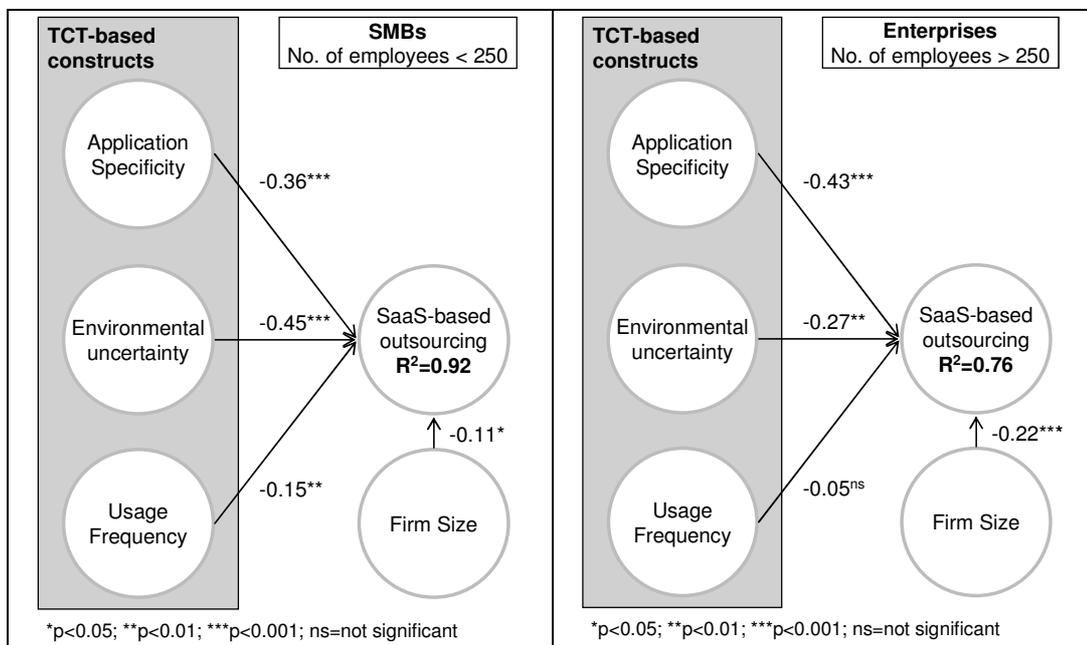*Figure 1.*   *Results of the Overall Model*

Figure 2.   *Comparison of Path Models SMBs vs. Enterprises*

5.3 Comparing SMBs and Enterprises on the drivers of SaaS-based sourcing

Based on sub-samples of 169 SMBs and 115 enterprises, structural equation models were calculated. Analogous to the assessment of the full sample, standardized path coefficients and the share of explained variance (R^2) were analyzed and compared (see Figure 2). In the SMB sample, application specificity and environmental uncertainty have both strong negative and significant paths leading to SaaS-based outsourcing. The paths from usage frequency and firm size to SaaS-adoption are also both negative and significant. A total of around 92% of the variance of SaaS adoption could be explained by TCT attributes and firm size. In the enterprise sample, 76% of total variance could be explained by the independent constructs in our research model. Paths from application specificity and firm size to SaaS-based outsourcing are both negative and highly significant. While environmental uncertainty is also negatively and significantly correlated with the dependent variable, the path from usage frequency is insignificant.

6 DISCUSSION

6.1 Major Findings and Interpretations

Finding 1: *Environmental uncertainty emerges as the strongest factor for SaaS-based outsourcing, while application specificity also significantly contributes to SaaS-based application sourcing.*

Linking the results of our empirical study to prior research, environmental uncertainty turns out to be the main deterrent of outsourcing on-demand IT applications as was also found out by Aubert et al. (2004). Most apparently, business and technical uncertainties still hinder IT executives and managers to take advantage of on-demand outsourcing options. Although asset specificity showed mixed results in its impact on the level of IT outsourcing in previous research, we found strong evidence that it can explain the level of IT outsourcing in the case of SaaS. This is also illustrated by our descriptive results on SaaS-based sourcing on the application level. While application systems, which supposedly have a lower degree of specificity in the sense that they are easier to transfer from one to another application context (such as CRM applications), show higher degrees of adoption, highly specific application systems (such as Operations & Manufacturing or Engineering applications) indicate very low adoption levels. Usage frequency as factor for SaaS-based sourcing showed inconsistent results. Obviously, the degree of interaction complexity and coordination intensity plays a more important role in the outsourcing decision for SMBs than for enterprises. This may be due to the fact that such organizational efforts attached to an outsourcing relationship engender a comparatively higher resource burden for SMBs than for enterprises. Overall, companies seem to be eager to acquire SaaS for applications that are not mission critical, involve relatively low data security and privacy concerns, and require little integration with on-premise applications. However, they still seem to be sceptical in application areas that involve transactions that are tied to mission critical processes including production and ERP and transactions between buyers and suppliers including ERP and logistics. Software vendors that shift from a traditional licensed model to SaaS will have to track the receptiveness of customers to the service delivery model in order to understand which applications will migrate when and position one's own offerings early in the uptake.

Finding 2: *While application specificity plays the strongest role in the adoption of SaaS-based applications in large enterprises, environmental uncertainty is the strongest factor for SaaS-based outsourcing in small- to mid-sized businesses.*

As illustrated in Figure 3 with the comparison between the path models of SMBs and enterprises, the weights of the paths from application specificity and environmental uncertainty to SaaS-based

outsourcing are reversed in their magnitude in dependence of organizational size. Here it can be argued that uncertainty is a stronger driver or barrier in the SMB decision to outsource compared to application specificity and usage frequency. Before a SMB is ready to make a positive outsourcing decision, it wants to feel ensured that future changes in prices, processes, and technical issues are safeguarded through specific (e.g., contractual, reputational) mechanisms so that it is not worse off than before. This reasoning is in line with prior studies where uncertainty and risk factors also played a major role in explaining IT outsourcing (e.g., Aubert et al., 2004; Clemons & Row, 1992). By contrast, large enterprises are rather hindered to outsource by the idiosyncrasies and intricacies of their IT landscape. Large firms tend to have more fragmented IT legacy systems built over a long period of time, which is often further complicated by complex business processes. For that reason, application specificity may play even a more important decision factor in enterprises than in SMBs when it comes to carving out IT applications in the wake of a positive IT outsourcing decision. These results have several important implications for management. On the one side, IT managers of SMBs evaluating the adoption of SaaS-based sourcing models should concentrate on clarifying and safeguarding for potential sources of business and technology uncertainty. Integrating these aspects into contractual modalities (e.g., into the price model or SLA specifications) could be an important step for the success of the entire outsourcing deal. On the other hand, IT managers of larger enterprises should rather focus on addressing the ease or difficulties of integrating application system services delivered by SaaS-application providers into processes and the IT landscape of the outsourcer. An in-depth assessment of the application portfolio for its level of application specificity would therefore be a valuable preparatory step for actual outsourcing evaluations and negotiations. On the other side, SaaS-application providers should develop and establish authentic trust-building mechanisms to reduce outsourcers' perceived uncertainty. Moreover, they should build up necessary skills and capabilities to help integrate their SaaS-based offerings into the outsourcers' process and IT landscape.

Finding 3: *Firm size is significantly and negatively associated with SaaS-based sourcing within, but not across the subgroups of SMBs and large enterprises.*

In terms of firm size as a factor influencing the level of SaaS-based outsourcing, we could find that the organizational size had no significant impact in the overall sample. However, when analyzing the sub-samples for SMBs and larger enterprises individually, we could observe a consistent significant effect of firm size on SaaS-based sourcing. This means that within the SMB and enterprise sub-samples respectively, firms with a lower number of employees had a comparatively higher SaaS-adoption rate than firms with a higher number of employees. These results are not entirely in sync with the proposition made by Kern et al. (2002a) that smaller and medium-sized firms are generally more prone to adopt on-demand outsourcing options. Our research findings rather point to a more sophisticated picture which shows that effects emanating from the sub-group level cancel out each other on the full sample level. This phenomenon may suggest the existence of moderator variables which intervene in the relationship between organizational size and SaaS-based outsourcing. Our empirical findings also indicate that the absolute adoption levels in 2007 and 2010 are comparatively lower for enterprises than for SMBs indicating that smaller and mid-sized firm tend to take advantage of flexible software sourcing models more strongly than corporations. However, according to our descriptive analysis, the gap between the SaaS adoption levels in SMBs and in enterprises will not widen but narrow in the future. These results add to the findings above that, against the predictions of many IT providers, SaaS-based sourcing is not only a valid option for SMBs, but also for larger corporations.

6.2 Limitations and Future Research

As with any research, this study does have some limitations. First, since our dataset is cross-sectional in nature, we can only show associations, not causality. Furthermore, assessing estimated adoption rates of SaaS-based sourcing models in 2010 is an insufficient proxy for studying longitudinal processes which could probably uncover time preferences in the adoption behavior of companies.

Second, although this study included 6 different countries and industries with consistent results, the low sample size in specific categories did not allow us to apply inferential statistics to explore the differences and commonalities between different countries, industries, and application types. Third, the investigation of SaaS-based outsourcing on the application level turned out to be a relevant and appropriate approach to gain concrete insights into different application markets. Focusing on a small set of special IT applications would foster an even more thorough understanding in selected areas of SaaS-based application sourcing. Accordingly, future research directions are to increase the sample size in the abovementioned categories and to extend our study database over time to pave the way for a longitudinal study. With regard to our theoretical framework and empirical findings, we can derive three further recommendations for future research. First, extending our transaction cost theoretical framework by other theories (e.g., incomplete contracts or property rights theory) would add further insights into the drivers and barriers of on-demand outsourcing. Second, deepening the notions of application specificity and environmental uncertainty as important drivers of SaaS-adoption would add more insights for researchers as well as practitioners. Last but not least, digging deeper into the relationship between firm size and SaaS-based sourcing would uncover more clearly what moderator variables intervene in the relationship between organizational size and SaaS-based sourcing.

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