

Are we already in a mature ITO market? A longitudinal study on the effects of market maturity on ITO vendor project performance

Research-in-Progress

Christoph Pflügler

Technische Universität München
Chair for Information Systems
Boltzmannstrasse 3
85748 Garching, Germany
christoph.pfluegler@in.tum.de

Manuel Wiesche

Technische Universität München
Chair for Information Systems
Boltzmannstrasse 3
85748 Garching, Germany
wiesche@in.tum.de

Helmut Kremer

Technische Universität München
Chair for Information Systems
Boltzmannstrasse 3
85748 Garching, Germany
kremer@in.tum.de

Abstract

Studies on information technology outsourcing (ITO) have shown different results for the influence of prior interaction and contract type on the project performance of the ITO vendor. The ITO market maturity could provide an explanation for these differences. However, it is not clear how to separate the ITO market into different maturity phases to gain insight into any possible effect maturity might have on project performance. We used a large dataset from an ITO vendor to analyze this research gap. We find that the ITO market has increased its maturity and can be separated into an immature phase, occurring between 1997 and 2001, a transition phase, occurring between 2002 and 2008 and a third phase which occurred after 2008. This identification of different phases of ITO market maturity will contribute to a deeper understanding of the influence of ITO market maturity on the project performance of ITO vendors.

Keywords: ITO vendor, market maturity, project performance, client knowledge, contract type

Introduction

According to a study of Gartner (2013), the global information technology outsourcing (ITO) market will reach \$288bn in 2013 with steady growth during the next several years. ITO is defined as the assignment of an IT task to a vendor, who charges a fee for conducting the service (Apte et al. 1997; Lacity and Hirschheim 1993; Loh and Venkatraman 1992). These IT tasks can vary ranging from “simple data entry to software development and maintenance, data center operations and full system integration” (Apte et al. 1997, p. 289). ITO services have become commoditized during the last years (Manning et al. 2011), which increased the competition between ITO vendors. Additionally, clients have gained more experience with the selection of the right vendor having learned from mistakes made in previous relationships (Lacity et al. 2010; Manning et al. 2011). Several studies argue that the ITO market has increased its maturity during the last two decades (Bapna et al. 2013; Dongus et al. 2014; Stadtmann and Kreutter 2009; Suarez et al. 2013; Susarla and Barua 2011). In order to survive in such a market, ITO vendors need to know how factors, such as client knowledge or contract type, contribute to the performance of their projects.

Empirical studies on the influence of client knowledge, which can be approximated through prior interaction, on the project performance of the ITO vendor have shown contradicting results. While most of the studies show prior interaction has a negative influence (Gopal et al. 2003; Hoermann et al. 2014; Schermann et al. 2014), Ethiraj et al. (2005) found a positive relationship. As the dataset employed in these studies cover different maturity phases, we analyze the moderating role of ITO market maturity on the relationship between client knowledge and project performance of the ITO vendor.

Previous studies have found that fix-price contracts have a negative influence on project performance of the ITO vendor (Ethiraj et al. 2005; Gopal et al. 2003), but the datasets in these studies comprised projects conducted prior to 2001, defined as the on-set of ITO market maturity by Susarla and Barua (2011) and Dongus et al. (2014). Dongus et al. (2014) found that the contract choice differs between the immature and mature phase of the ITO market. Therefore, we focus on the moderating role of market maturity on the relationship between contract type and project performance.

We formulated the following research question to address these identified gaps in our knowledge of the influence of ITO market maturity: *How does the influence of client knowledge and contract type on project performance of the ITO vendor differ based on the maturity of the ITO market?*

To address our research question it is necessary to divide the ITO market into different phases based on the level of maturity. Susarla and Barua (2011) and Dongus et al. (2014) argue that the ITO market reached maturity after 2001. Other authors have identified 1998 (Suarez et al. 2013) and 2006 (Stadtmann and Kreutter 2009) as the years maturity was reached. Bapna et al. (2013) did not explicitly identify a date, but treated the maturation as a continuous process. These different concepts call for further research.

We conducted an empirical study with a unique quantitative dataset from a German ITO vendor, called ALPHA. The dataset covers all projects conducted by ALPHA between 1995 and April 2014. The extended time period makes it possible to analyze the maturation of the ITO market. The initial dataset contains more than 36,000 projects for about 2,000 different clients. We find that the ITO market has increased its maturity and can be divided into an immature phase, which occurred between 1997 and 2001, a transition phase, between 2002 and 2008, and a third phase which occurred after 2008. Whether this latter phase is a mature or a second transition phase will be addressed in future research.

The remaining sections of this paper are structured as follows. First, we present background information on project performance and ITO market maturity. This is followed by an explanation of our research model and the hypotheses that are examined are developed. We then present the research method and the studies' preliminary results. The paper ends with our plans for future research on the topic.

Background on ITO vendor project performance and market maturity

Project performance

Lacity et al. (2010) reviewed literature on empirical ITO studies. According to their results, only 8 of 741 analyses considered the ITO vendor's business performance as the dependent variable. To approximate

business performance, several measures, such as the project profitability (Gopal and Koka 2010; Hoermann et al. 2014; Schermann et al. 2014), the absolute profits (Ethiraj et al. 2005; Gopal and Koka 2012; Gopal and Sivaramakrishnan 2008; Gopal et al. 2003) and the project price (Gefen et al. 2008) have been employed. Project performance is a complex construct influenced by many factors including client knowledge and contract type.

Repeat interactions increase the ITO vendor knowledge of the processes, structures and technologies of the client (Banerjee and Duflo 2000; Chen and Bharadwaj 2009; Mani et al. 2013). Therefore, the vendor better understands the needs of the client and the tasks of relevance for the project (Chen and Bharadwaj 2009). This knowledge should increase project performance, an argument supported by the findings of Ethiraj et al. (2005). Other studies indicate that prior interaction has a negative effect on the project performance of the ITO vendor (Gopal et al. 2003; Hoermann et al. 2014; Schermann et al. 2014). Gopal et al. (2003) argue that their result could be specific to the market analyzed in their study. Another explanation for the negative effect is the increasing complexity occurring in future projects with the same client (Hoermann et al. 2014) or that the vendor from time to time engages in explorative organizational learning activities which have a negative impact on profitability (March 1991; Schermann et al. 2014).

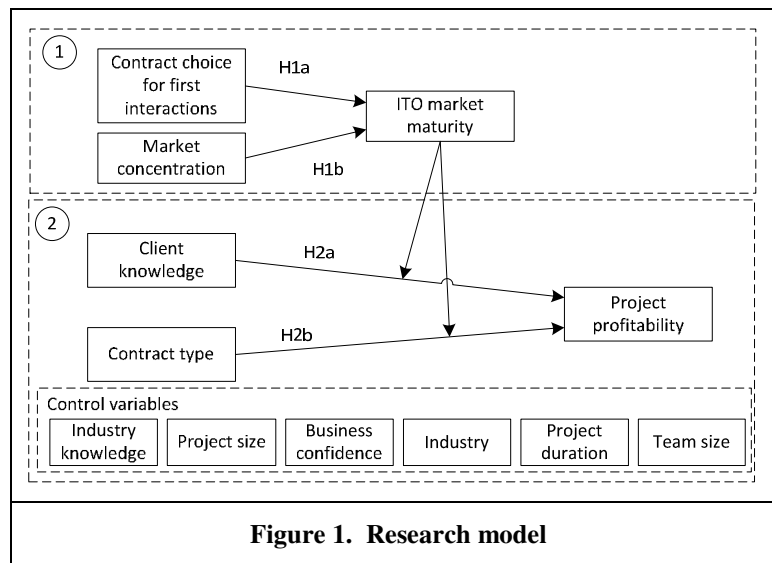
The two prevalent types of ITO contracts are fix-price (FP) and time and material (TM) (Gopal et al. 2003; Lichtenstein 2004). In FP contracts, the ITO vendor agrees to deliver a predefined result and is compensated with a certain fee (Ethiraj et al. 2005). TM contracts are different because the billing is based on the agreed hourly rate and the working hours invested by the ITO vendor (Ethiraj et al. 2005). Previous studies have found that FP contracts have a negative influence on project performance of the ITO vendor (Ethiraj et al. 2005; Gopal et al. 2003). Gefen et al. (2008) did not find a significant influence of the type of contract on project performance.

ITO market maturity

Several studies argue that the ITO market is in a mature phase (Dongus et al. 2014; Stadtmann and Kreutter 2009; Suarez et al. 2013; Susarla and Barua 2011). In general, the theory on industry life-cycle assumes that at a certain point in time a structural change occurs transforming the industry from a growth (immature) phase to a mature phase (Agarwal et al. 2002; Williamson 1975). The immature phase is characterized by high uncertainty, rapid market growth, an increasing number of firms and a low market concentration. The mature phase is associated with low uncertainty, decrease of market growth to a normal rate, domination of the market by a stable number of companies and a high market concentration (Agarwal et al. 2002; Klepper 1996; Klepper and Graddy 1990; Mazzucato and Semmler 1999; Thorelli and Burnett 1981; Williamson 1975). The industry life-cycle can be separated into different phases (Agarwal et al. 2002; Avnimelech and Teubal 2006; Cusamano et al. 2015; Klepper 1996; Klepper and Graddy 1990; Williamson 1975). Cusamano et al. (2015) focus on the lifecycle of service industries and argue that three phases exist: ferment, transition and mature. A similar three-phase model has been proposed by Klepper and Graddy (1990).

According to Susarla and Barua (2011) and Dongus et al. (2014), the ITO market entered into a mature phase after the year 2001. They argue that the collapse of the internet sector acted as an endogenous shock to change the market. However, Suarez et al. (2013) argue that the mature phase began in 1998. Employing a certain point of time for separating the maturity phases assumes that the market matured in a very short timeframe. Bapna et al. (2013) used a continuous time dependent variable for measuring ITO market maturity, which suggests that maturation is an ongoing activity. A transition phase, as proposed by Klepper and Graddy (1990), has only been assumed by Stadtmann and Kreutter (2009) who argue that the ITO market was in a transition phase between 2000 and 2006.

Research model and hypotheses



The previously described different concepts for separating the ITO market call for further research. Based on the market maturity model proposed by Klepper and Graddy (1990) and Cusamano et al. (2015), the following hypothesis is proposed:

H1: The ITO market can be separated into immature, transition and mature phases.

One possibility to measure ITO market maturity is the probability of opportunistic behavior by the vendor. The literature on transaction cost economics argues that the danger of opportunistic behavior is a central construct of exchange relationships (Williamson 1979). According to Williamson (1985) and Hill (1990) the probability of opportunistic behavior increases with uncertainty. Uncertainty makes it difficult to distinguish opportunistic from cooperative vendors (Hill 1990). As previously mentioned, uncertainty in the market differs between the different phases of market maturity (Agarwal et al. 2002; Klepper 1996; Klepper and Graddy 1990). Therefore, the probability of opportunistic behavior is dependent on the market maturity. This view is supported by Argyres and Bigelow (2007) who found that the effect of transaction cost economics is dependent on industry maturity and Dongus et al. (2014) who found that transaction cost economics is only relevant in the immature phase of the ITO market.

Clients try to protect themselves from opportunistic behavior through their choice of contract (Kalnins and Mayer 2004; Susarla and Barua 2011). FP contracts decrease the possibility of the vendor to act opportunistically because the delivery of a predefined result has been agreed upon and any cost overruns are borne by the vendor (Ethiraj et al. 2005; Gopal and Sivaramakrishnan 2008; Lichtenstein 2004).

Asymmetric knowledge between the vendor and the client, which tends to occur during their initial interactions, also enables opportunistic behavior (Williamson 1985). Furthermore, if only a few interactions have occurred, the client does not know whether the vendor tends to act opportunistically (Gefen et al. 2008; Hill 1990). Therefore, the choice of contract for the first few interactions can be used as a proxy for market maturity.

H1a: The ITO market can be separated into immature, transition and mature phases based on the contract choice for the first few interactions between the ITO vendor and the client.

A second possibility for measuring maturity is the market concentration of the ITO market. The number of participants decreases to a stable number in the mature market (Agarwal et al. 2002; Klepper 1996). As the market size does not decrease accordingly, the market concentration can be used as an indicator for market maturity (Agarwal et al. 2002; Mazzucato and Semmler 1999; Thorelli and Burnett 1981). Therefore we formulate the following hypothesis:

H1b: The ITO market can be separated into immature, transition and mature phases based on the concentration of the ITO market.

The influence of ITO market maturity on the relationship between client knowledge and project performance has not yet been examined. Suarez et al. (2013) analyzed the direct influence of maturity on the operation margin of software vendors, but they did not find a significant influence. Karniouchina et al. (2013) argue that the determinants of firm performance are different between the stages of the industry life-cycle. As previously mentioned, results on the relationship between client knowledge of the vendor and project performance are contradictory. The dataset of Hoermann et al. (2014) and Schermann et al. (2014) covers the time between 2004 and 2011 and therefore comes from the mature ITO market according to the definition provided by Susarla and Barua (2011), Dongus et al. (2014) and Suarez et al. (2013). Ethiraj et al. (2005) and Gopal et al. (2003) employed datasets with projects conducted prior to 2001. Their datasets, therefore, might differ in respect to the maturity of the ITO market.

Through repeated interaction with the same client, the vendor gets to know the client's capabilities, its business environment and its culture (Kalnins and Mayer 2004). During repeated interactions with the same client, the vendor tries to develop knowledge about the client which might lead to a competitive advantage and enable the vendor to increase project profitability. However, this is dependent on the maturity of the ITO market.

First, the bargaining power of the vendor decreases with increased maturity. According to Manning et al. (2011), ITO services have become commoditized in recent years. Bapna et al. (2013) found that multi-sourcing increases with ITO market maturity. These developments increase the competition between the ITO vendors and decrease the client's dependence on the vendor which makes switching the ITO vendor easier (Gopal et al. 2003; Manning et al. 2011). Additionally, clients have become more familiar with ITO during the last several years (Lacity et al. 2010).

Second, ITO vendors might be forced to continuously develop new capabilities in a mature market. Schermann et al. (2014) argue that the vendor engages in explorative organizational learning activities with the client from time to time. These projects are associated with higher risk and a lower expected project profitability (March 1991). Because the competition on the ITO market has increased (Manning et al. 2011), ITO vendors might engage in more explorative projects to differentiate themselves from competitors.

Because of changes in vendor bargaining power and the continuous need for vendors to develop new capabilities in a mature market, it is difficult for ITO vendors to leverage client knowledge and demand higher prices. Therefore the following hypothesis has been formulated:

H2a: Client knowledge can be leveraged and therefore increases the project performance of the ITO vendor in the immature ITO market but not in the mature ITO market.

According to findings by Gopal et al. (2003) and Ethiraj et al. (2005), FP contracts, in comparison to TM contracts, have a negative influence on the project performance of the ITO vendor. The datasets used in those studies, however, comprise projects conducted prior to 2001. These results are contradicting: the vendor should be compensated for taking higher risks in FP contracts as it bears all possibly occurring cost overruns (Ethiraj et al. 2005; Gopal and Sivaramakrishnan 2008; Lichtenstein 2004). Perhaps the relationship found by Gopal et al. (2003) and Ethiraj et al. (2005) was due to the immature ITO market where FP contracts are used as a protection against opportunistic behavior for the first few projects (Dongus et al. 2014; Williamson 1985).

FP contracts have a negative influence during the immature phase of the ITO market. The prevalent high uncertainty makes it difficult to estimate the project and therefore leads to contractual gaps which need to be closed during the project (Williamson 1979). These renegotiations create additional costs and lead to lower profitability (Hoermann et al. 2014; Williamson 1979). On the other hand, FP contracts have a positive influence in the mature market because uncertainty is lower. Furthermore, ITO vendors have improved their competences in recent years (Lacity et al. 2009) and should, therefore, be more capable of efficiently managing FP projects.

H2b: FP contracts in comparison to TM contracts have a negative influence on project performance of the ITO vendor in the immature market and a positive influence in the mature ITO market.

Research method and preliminary results

We have already completed the construction of the dataset which is described below. This paper focuses on the separation of the ITO market into different phases of maturity. Therefore, only hypotheses H1a and H1b are examined. Hypotheses H2a and H2b will be addressed in future research.

Research site and data collection

In order to examine the influence of ITO market maturity on the contract choice, we collected quantitative data from ALPHA, a large German IT service provider. ALPHA generates most of its revenue through consulting projects for clients from various industries, but also offers other ITO services such as standard software development and hosting.

The data have been extracted directly from the project controlling system of ALPHA who granted us access to all 36,413 projects conducted between January 1995 and April 2014. The information on the projects is of high quality because it was extracted from the project controlling system of ALPHA, which is also used for billing clients. Additionally, directly accessing quantitative data is not subject to recall bias, which could be a problem in case studies and surveys (Gefen et al. 2008). The dataset contains many variables such as the project profitability, the contract type, the team size, the number of interactions with the client as well as within the industry, the business confidence [based on the ifo index (ifo Institute 2014)], the project start, the project size, the industry of the client and the project duration. We filtered out internal projects, removed projects with incomplete data, and applied trimming (Eriksson et al. 2006) to the project volume, project profitability, project duration and team size in order to remove outliers. This approach is commonly used in empirical ITO vendor studies to clean the dataset (Hoermann et al. 2014; Schermann et al. 2014; Suarez et al. 2013). The first two years of data from the dataset were removed because the first projects for a client should really be the first ones and not simply the start of the dataset. The number of short projects increases towards the end of the dataset as it includes only finished projects. To address this issue, the projects from 2013 and 2014 were removed to have a realistic composition of projects. The final dataset contains 19,895 projects for 1,394 different clients conducted between 1997 and 2012.

Results for contract choice of the first few interactions between client and vendor

Variable	Unit	Min	Mean	Max	SD
Number of interaction with client	Number	1	2.25	5	1.34
Business confidence	Points	84.5	103.21	115	7.26
Team size	Number	1	3.01	63	4.32
Project duration	Days	1	194.10	3,071	317.52
Project size	Hours worked	0.5	700.70	46,268.02	2,470.16
Project start	Days since 01.01.1997	1	3,666.67	5,830	1,413.09

In order to examine the first few interactions, we removed projects where ALPHA and the client had more than 5 prior interactions. The created sub-dataset contains 2,968 projects.

Dependent variable: contract type (0 = TM, 1 = FP)		
Variable	Estimate	z-Value
(Intercept)	-0.789375	-1.783
log(Number of interaction with client)	0.039609	0.867
Business confidence	0.009966*	2.522
log(Team size)	0.456609***	10.217
log(Project duration)	-0.066257**	-3.206
log(Project size)	-0.079487***	-3.383
factor (industry) ¹	between -1.301447 and 0.420885	between 0.655 and -5.630
Significance: *** = significant at the 0.1% level; ** = significant at the 1% level; * = significant at the 5% level		
¹ because of confidentiality issues the estimates for different industries are not displayed		

In addition to the numerical variables described in Table 1, the dataset contains categorical variables. *Contract type* is measured with a binary variable, where “1” stands for a FP and “0” for a TM contract. The dataset contains 785 FP and 2,183 TM contracts. The variable *Industry* denotes the industry of the client and is based on the ISIC Rev. 4 categorization (United Nations Statistics Division 2015). The projects were conducted for clients from 17 different industries.

In order to examine the influence of ITO market maturity on the contract choice, a generalized additive model for dichotomous dependent variables with a probit link function has been used because it reveals non-linear relationships (Hastie and Tibshirani 1990; Imai et al. 2012). Some of the independent variables have been log-transformed to reduce skewness (Hair et al. 2006). The variance inflation factor did not show any sign of multi-collinearity (James et al. 2013; Sachs and Hedderich 2009). *Project start* has been included in the model as a nonparametric smoothing term. The other variables, whose linear estimates are shown in Table 2, were estimated with standard parametric methods.

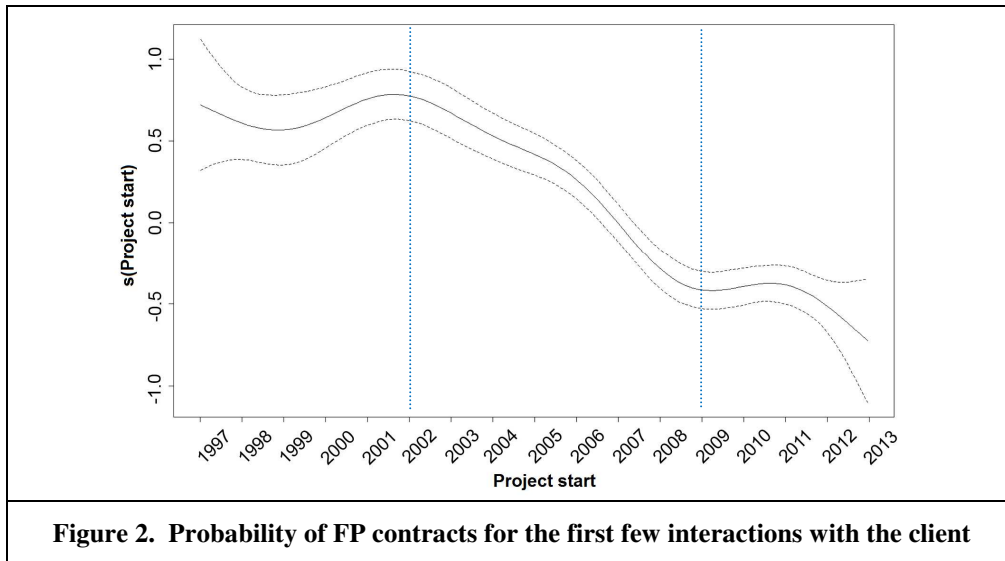
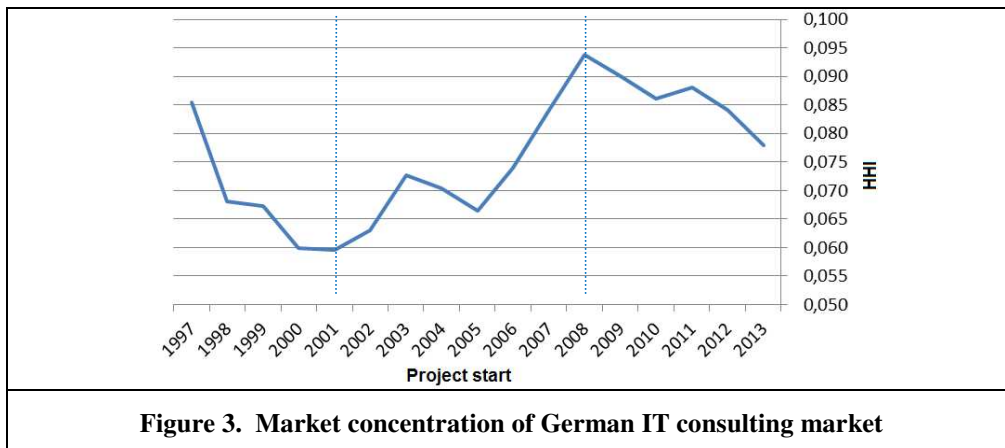


Figure 2 shows the non-linear plot for the variable *Project start* of the generalized additive model for dichotomous dependent variables. The dotted lines indicate the 95% significance interval. Figure 2 can be interpreted as the probability to have a FP contract for the first few vendor-client interactions. The graph shows a more or less horizontal relationship until the end of 2001 and then declines until mid-2008. There is a more or less horizontal trend until the end of 2010, then a decline; the 95% significance interval, however, widens.

Results for market concentration



Another possibility to analyze the maturity of the ITO market is to calculate its market concentration. The German IT consulting market between 1997 and 2013 was chosen as a proxy because ALPHA is a part of it. For measuring the market concentration, the Herfindahl-Hirschmann-Index (HHI) has been used and is defined as the sum of the square of the companies' market shares (Herfindahl 1950; Hirschman 1945). As it is difficult to get reliable revenue figures for the entire market, a ranking of the 25 largest companies, published yearly by Lünendonk (2015), has been used as a proxy. Bailey and Boyle (1971) found that focusing on at least the eight largest companies in a market does not decrease the validity of the HHI.

For the interpretation of the market concentration, we focused on long-term trends. Therefore, we considered only trends lasting several years. The market concentration decreased from 1997 to 2001, then increased until 2008. The last few years are characterized by a slight decrease of market concentration. The results seem to indicate structural changes occurring at about years 2001 and 2008.

Separation of the ITO market

Hypothesis H1a is supported. It is possible to distinguish three different phases of ITO market maturity based on the probability of having a FP contract for the first few interactions, which is a proxy for expected opportunistic behavior. The first phase lasted until the end of 2001, which is the year of separation between the immature and mature markets as defined by Susarla and Barua (2011) and Dongus et al. (2014). In this phase, the expectation of opportunistic behavior remains constant and high in comparison to the other phases. Therefore, it can be assumed that the ITO market was in an immature state until the end of 2001. The second phase occurred between 2002 and 2008 during which the expectation of opportunistic behavior continuously declined. This can be seen as a transition phase between the immature and the mature market (Klepper and Graddy 1990). As the significance interval increases during the third phase, which started in 2009, it is not possible to determine whether the expectation of opportunistic behavior has been constant or has decreased after 2010. A constant expectation would be a sign that the ITO market has reached maturity while a decrease would argue for a second transition phase.

Hypothesis H1b is supported as well. There was a decrease in market concentration until 2001, indicative of an immature market: the market attracts new entrants which decreases the concentration (Agarwal et al. 2002; Klepper 1996). During the following phase, which lasted until 2008, the market concentration increased. This is characteristic of a transition phase where the number of competitors decreases (Cusamano et al. 2015; Klepper and Graddy 1990). Although in this case the market concentration decreased after 2008, in a mature market, the concentration would remain constant. This decrease is actually a sign of an immature market. Mazzucato and Semmler (1999) analyzed the market concentration of the US automobile market between 1909 and 1995. Their results indicate a high volatility of market concentration for the first decades, decreasing over time with stabilization of the market since the mid-1970s (Mazzucato and Semmler 1999). Transferring these patterns to the ITO market indicates that the ITO market might not have yet reached maturity and still converges towards it.

As H1a and H1b indicate the same three time frames, hypothesis H1 is supported. In general, the maturity of the ITO market has increased. However, it is not clear if the ITO market is already in a mature state or if it is still in a transition phase. Klepper and Graddy (1990) have analyzed the lifecycle of several industries and found that the transition phase can last for several decades. The year 2001 has been defined as the start of the maturity of the ITO market by Susarla and Barua (2011) and Dongus et al. (2014). Our results indicate that a structural change took place, but we cannot conclude that the market is mature after 2001. Bapna et al. (2013) assumed that maturity is a continuous activity and not a certain point of time. We can support this assumption for the transition phase, but not for the other two phases. The structural change of the ITO market in 2008 has not yet been found in the literature. The financial crisis and the following economic downturn, which took place in 2008, seem to have influenced the ITO market maturity. This phenomenon calls for further research.

Limitations and future work

Before we outline our future research on the moderating effect of ITO market maturity, some limitations of our current research should be mentioned. It has been assumed that expected opportunistic behavior is especially important during the first 5 interactions between the vendor and the client. This assumption is

based on an interview with a manager from ALPHA. He stated that about 5 interactions are necessary for a client to develop a trusting relationship with the vendor. He reasoned that one or two successful projects (from the viewpoint of the client) could occur because of luck, but it is unlikely that five projects are successful due to chance. In order to mitigate this limitation, models for the first one to nine interactions with a client have been constructed. The non-linear results show the same patterns.

The data used in our study comes from only one company. Therefore, the relationships we found possibly describe the maturation of this company and not of the ITO market. However, ALPHA was founded nearly two decades prior to the start of the dataset and was one of the largest companies of its sector during the entire time covered by the dataset. Therefore, ALPHA was presumably already a mature company at the beginning of the dataset. We plan to perform the same analyses on a second dataset with more than 40,000 projects from an ERP service provider. Up to now, we analyzed the market concentration of the German IT consulting market. To address this limitation, we plan to include data from other ITO market segments as well.

According to Bapna et al. (2013), multi-vendor contracting increases with ITO market maturity. From the perspective of a single vendor, this implies that the project size decreases as more vendors work on the same project. Therefore, estimating the influence of project start on the project size could be used as another indicator of market maturity.

After having shown the feasibility of separating the ITO market into different phases, we will separate the dataset accordingly into sub-segments to address the hypotheses H2a and H2b in our future research. We plan to employ generalized additive models for continuous dependent variables (Hastie and Tibshirani 1990; Imai et al. 2012) because the relationships between some of the independent variables and project performance are highly non-linear (Schermann et al. 2014). With the exception of Schermann et al. (2014), other studies on ITO vendor project performance have assumed linear relationships (Ethiraj et al. 2005; Gefen et al. 2008; Gopal and Sivaramakrishnan 2008; Gopal et al. 2003). In order to answer H2a and H2b, the results for the independent variables will be compared between the different subsets.

Expected contribution and conclusion

We expect to contribute to theory by enhancing current knowledge of ITO market maturity. We identified three different phases of maturity with two separating structural changes. The first one, which occurred in 2001, had already been identified by Susarla and Barua (2011), but the second one, which occurred in 2008, had not yet been identified. We employed two completely different approaches to identify market maturity. The same time frames and points of structural changes have been identified. Therefore the identified phases are quite reliable. When completed, our further research on hypotheses H2a and H2b will contribute to the research stream of ITO vendor project performance. The moderating role of ITO market maturity has not yet been analyzed and should reveal new relationships.

According to our analysis of the dataset, the maturity of the ITO market has increased and we identified three maturity phases occurring between 1997 and 2012. The results indicate a transition phase occurs between the immature and the mature ITO market. Up to now, this phase of the ITO market has only been considered by Stadtmann and Kreutter (2009). The question whether the ITO market is already in a mature phase could not be completely answered and will be addressed in future research.

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