Buyer Commitment and Opportunism in the Online Market for IT Services

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ABSTRACT AND KEYWORDS	
Abstract	Companies increasingly outsource IT-related tasks using reverse auction mechanisms embedded into online marketplaces. However, a considerable proportion of auctions at these marketplaces do not result in a contract between buyer and supplier. Extant literature mostly refers to costly bidding and bid evaluation to explain this phenomenon. Another possible explanation is that because of the low entry barriers, buyers with a low commitment to exchange can use the marketplace solely for information gath-ering purposes such as price benchmarking and obtaining free consultations, having little or no intention to contract a supplier. We test this explanation by looking at how different types of costs incurred by the buyer during the sourcing process, are related to the outcome of reverse auctions in terms of contract award. We argue that higher levels of search, preparation and negotiation costs are associated with higher commitment to exchange and find that opportunistic behaviour does indeed play a part in the non-contracted projects, while committed buyers are more likely to enter into a contract with a supplier. The hypotheses are tested on a sample of 2,574 reverse auctions at a leading online marketplace for IT services and further verified across projects of different value and different levels of buyer experience. On the practical side, we recommend setting up entry barriers for buyers with a low level of commitment.
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Buyer Commitment and Opportunism in the Online Market for IT Services

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Abstract: Companies increasingly outsource IT-related tasks using reverse auction mechanisms embedded into online marketplaces. However, a considerable proportion of auctions at these marketplaces do not result in a contract between buyer and supplier. Extant literature mostly refers to costly bidding and bid evaluation to explain this phenomenon. Another possible explanation is that because of the low entry barriers, buyers with a low commitment to exchange can use the marketplace solely for information gathering purposes such as price benchmarking and obtaining free consultations, having little or no intention to contract a supplier. We test this explanation by looking at how different types of costs incurred by the buyer during the sourcing process, are related to the outcome of reverse auctions in terms of contract award. We argue that higher levels of search, preparation and negotiation costs are associated with higher commitment to exchange and find that opportunistic behaviour does indeed play a part in the non-contracted projects, while committed buyers are more likely to enter into a contract with a supplier. The hypotheses are tested on a sample of 2,574 reverse auctions at a leading online marketplace for IT services and further verified across projects of different value and different levels of buyer experience. On the practical side, we recommend setting up entry barriers for buyers with a low level of commitment.

Keywords: reverse auctions, online markets, IT outsourcing, opportunism, transaction costs.

1. Introduction

Proliferation of information technologies (IT) shifts the boundaries between the firm and the market, increasing the range of activities performed outside a firm (Malone, et al. 1987). A typical example of activities that cross corporate as well as national boundaries is outsourcing of IT services. The export of IT services from India has surpassed USD 16 bln. in 2003-2004 and the growth in the emerging outsourcing destinations, such as Eastern European countries, can be as high as 40% per year (Radkevitch 2005). Examples of online marketplaces, at which an increasing number of contracts for IT outsourcing are made, include eWork.com, Elance Online and RentACoder.com[1]. Contracts at these marketplaces are allocated primarily via reverse auctions, a recently introduced procurement tool (Jap 2002, Kaufmann and Carter 2004). These marketplaces also host a number of value-added exchange-related processes beyond the auction, such as risk mitigation or online collaboration (Kambil and van Heck 2002) and deal with complex issues related to the exchange of IT services such as the difficulty of objective quality evaluation and the heterogeneity and information asymmetry of the exchange process (Snir and Hitt 2003). This exchange complexity may be a reason why only 30-40% of these auctions end with the contract being actually awarded to a supplier by the buyer (Snir and Hitt 2003).

In this paper, we conduct an in-depth examination of an alternative set of explanations for this low percentage of awarded contracts, by studying buyer behaviour at a major online marketplace for IT services. We start with the observation that, because the critical mass of demand at these online marketplaces is crucial for their existence, entry barriers for buyers are kept as low as possible. However, this then lays the market open to the opportunistic buyers... These opportunistic buyers can use market mechanisms for price benchmarking (when the buyer uses the online market price as a reference in off-market negotiations) or for obtaining free advice from suppliers, with no intention of allocating a contract at the marketplace. Therefore, in addition to the inherent complexity of IT services and the costs of bidding and bid

[1] The amount of projects allocated via RentACoder.com on a monthly was close to 10 thousand, and growing at 5% per month.

evaluation at marketplaces for IT services, market design in the form of entry barriers may be another factor responsible for auctions that do not result in contract awards.

This paper investigates the respective roles of commitment and opportunism by looking at the different types of costs that an IT services buyer incurs during the sourcing process. Since it is the buyers who decide how much time to invest in searching for suppliers, preparing the project description and evaluating and renegotiating the bids, these costs represent the effort they are willing to make for this auction to be a success in terms of supplier selection. Hence, these costs can serve as an indicator of how committed a buyer *ex ante* is to actually award the contract.

This paper makes several contributions: 1) it explains contracting practices at online marketplaces for IT services by providing insights into buyer behaviour. We distinguish between two groups of buyers – committed buyers and those who are inherently unwilling to award projects – and discuss the implications of the differences in their behaviour; 2) it contributes to the literature on exchange opportunism (Stump and Heide 1996, Wathne and Heide 2000) by investigating the role of buyers' ex-ante commitment and opportunism in contracting for IT services, while the majority of extant literature focuses instead on the ex-post opportunism of the suppliers (Stump and Heide 1996); 3). We then come up with a recommendation for improvement of the design of online marketplaces for IT services so that a balance can be maintained between attracting a critical mass of buyers and maintaining marketplace efficiency.

The paper is organised as follows: section 2 contains a review of relevant literature on online markets and exchange opportunism. In section 3 we describe the empirical setting of an online marketplace for IT services and introduce our measures. In section 4, we first validate our data and model by reproducing findings by Snir et al., 2003 and then move forward to empirically testing the effects of buyer costs. Section 5 presents the discussion and conclusions, in which we elaborate on the implications of this study and examine tradeoffs for efficient design of online markets.

2. Theory and Hypotheses

2.1. Literature review

Online markets for IT services

The emergence of online markets gave rise to a remarkable extension of the application of auction mechanisms. The technological developments made auctions a key tool for online negotiations (Bichler 2000, Koppius 2002) and brought about innovative auction mechanisms including combinatorial (Harstad, et al. 1998) multi-dimensional (Bichler 2000, Koppius 2002) and reverse auctions (Jap 2003). The focus of this paper is on reverse auctions, where suppliers make their bids for fulfilling customer requirements (Jap 2003).

Early theory predicted that the proliferation of IT will spur the growth of online markets and produce different exchange outcomes at online markets compared to regular markets. Reduction of coordination costs due to the introduction of IT was predicted to lead to a shift from hierarchy to market governance in some exchange situations (Malone, et al. 1987), while decrease in transaction costs, namely search costs, was supposed to result in higher allocation efficiency and lower prices for markets of commodities and differentiated goods (Bakos 1991, Bakos 1997). Subsequent empirical investigations revealed that prices at online markets depend on a number of factors, including differences in quality, transportation costs (Bailey, et al. 1991), preference matching (Lee 1998) and the amount of available information (Koppius 2002, Lee 1998) at online markets compared to off-line markets.

Lowering search costs in online markets may not always lead to efficiency gains either. (Gu and Hitt 2001) argue that lowering transaction costs facilitates market access for less informed players whose behaviour creates "noise" at the market, thereby leading to a decrease in overall social welfare. (Campbell, et al. 2005) study the impact of reduced search costs on commodity prices at online markets and find that while in the static setting prices do fall under decreased search costs, in the dynamic environment the prices can go up due to the increase in suppliers' collusion enabled by lower search costs (Campbell, et al. 2005). Snir et al., 2003 examine costly bidding and bid evaluation at reverse auctions for IT services. Their model relates the number and quality of bidders at individual auctions to market characteristics, RFP (request for proposal) information and bidding costs. Carr 2003 further elaborates on the setting introduced by Snir et al., 2003, modelling bid evaluation costs to investigate their impact on bidding and contract decisions. In case an auction attracts too few or too many bids it is uneconomical for the buyer to perform evaluation and award her contract (Carr 2003) and hence the percentage of awarded contracts will drop.

Opportunism in economic exchange

Opportunism is defined as self-interest seeking with guile. Transaction costs economics has identified opportunism as one of its key assumptions about the behaviour of economic agents along with bounded rationality and self-interest seeking and imperfect information at the market (Williamson 1985). According to (Williamson 1993): "…huge number of interesting problems of economic organization are missed or misconstrued if opportunism is ignored or suppressed" (p. 97).

Most of the extant literature has focused on ex-post opportunism, i.e. opportunism within ongoing economic exchanges, after the contract between the exchange parties has actually been made. Four types of ex-post opportunism are identified in explicit or relational contracts (evasion, refusal to adapt, violation and forced renegotiation) that originate from two conditions typical for such contracts: lock-in and information asymmetry (Wathne and Heide 2000). Opportunism can be managed by different governance mechanisms as well as relational safeguards and incentives. Wathne et al., 2000 identify four such governance mechanisms: monitoring, incentives, selection and socialization, while Stump et al., 1996 recommend using qualification of supplier motivation and ability as well as suppliers' specific investments in order to safeguard the buyer's specific investments. (Jap and Anderson 2003) find that under an increased level of ex-post opportunism bilateral idiosyncratic investments still perform well as a safeguard, goal congruence also performs well but there is no effect of interpersonal trust.

Most of the studies of opportunism either focus on the opportunistic behaviour of the supplier (Stump and Heide 1996, Wathne and Heide 2000, Wuyts and Geyskens 2005), or do not distinguish between the types of opportunistic behaviour of different exchange parties (Jap and Anderson 2003). However, several studies emphasize that reverse auctions can use buyers opportunistically. Reverse auctions are believed to be used by buyers as an instrument of power-based bargaining and suppliers view this as a form of opportunistic behaviour and may, in their turn, behave opportunistically (Emiliani 2004); both incumbent and new suppliers become suspicious of a buyer's opportunism when invited to participate in reverse auctions, even though incumbents are still willing to make idiosyncratic investments in the exchange (Jap 2003). Sinr and Hitt 2003, drawing on (Weber 1995), suggested that buyers at online marketplaces for IT services might behave opportunistically by not entering into contracts at an electronic marketplace in order to profit from the obtained information while trading in an off-market mode; and that such behaviour is more likely to be present in higher-value projects.

2.2. <u>Hypotheses</u>

Buyer opportunism can exist at online reverse auctions both when auctions are used as a separate procurement tool within predominantly off-line sourcing processes (Smeltzer and Carr 2003) as well as at online marketplaces (Snir and Hitt 2003). For the purpose of the present analysis we assume that all buyers at an online marketplace for IT services are divided into two broad categories – some of the buyers are inherently committed to entering into the exchange, while other buyers are opportunistic. This type of division is supported by observations from online marketplaces. For example, according to the data from Elance Online some of the returning buyers have a contract award rate close to 100% (e.g. a buyer posted 10 requests for proposals and awarded 9 projects), while others have an award rate of 10% or even 0% (e.g. a buyer posted 6 requests for proposals and no winners were ever selected). An alternative explanation is that a very low award rate might be caused by a lack of fitting suppliers but this does not seem very likely as it underestimates the effect of learning.

We define committed buyers as those buyers who come to the marketplace with the purpose of contracting an appropriate supplier and executing a project. These buyers are looking to award the contract to a winner at a reverse auction but may not do so if their preferences are not met. We assume that a committed buyer will undertake reasonable efforts to award the contract using online market functionality to find an optimal match. Activities directed at finding the best match involve costs for a committed buyer (although the level of these costs at an online marketplace can be lower in comparison to an off-line market). For instance, the buyer needs to provide an appropriate project specification and sometimes also to get feedback on the details of the project from experienced suppliers. Although the costs of developing a specification and communicating with a supplier can be low in absolute terms, they can still be significant compared to the project value of many typical IT projects, which are several hundred US dollars worth (e.g. development of a simple website).

By contrast, an opportunistic buyer is not primarily interested in executing a contract through the online marketplace, but uses the marketplace for other purposes. For instance, such a buyer may look for insights into the price level in order to occupy a stronger position in negotiations with outside suppliers (Smeltzer and Carr 2003), or just aim at receiving a free advice from the suppliers during the bidding stage. In this category we also include “naïve” buyers, who can considerably under-estimate the costs of specifying or developing their projects (we address this issue in the data analysis section). Because of the fly-by-night nature of opportunistic buyers, we assume that they will be less willing to bear idiosyncratic costs that can improve the chances of optimal allocation.

To summarize our main intuition, a committed buyer is aiming at allocating her project at the online marketplace and is therefore more likely to invest in contracting optimal suppliers, whereas an opportunistic buyer is not primarily seeking project allocation (although she may still allocate if the match with prospective supplier seems particularly good) and therefore will bear lower costs.

We identify three types of costs the buyer can incur when pursuing optimal allocation: search costs, preparation costs and negotiation costs. These costs are based on the phases of the sourcing process which is typical for this type of online marketplaces. Differentiating between the three types of costs enables us to consider in greater depth the differences between committed and opportunistic behaviour in the next section.

2.2.1. <u>The Buyer's search costs</u>

Previous theoretical research into auctions developed an analytical model of reverse auctions in which the buyer creates an RFP and awaits bids from suppliers (Carr 2003, Snir and Hitt 2003). In reality, reverse auctions are embedded into a broader sourcing context that can include search for suppliers, short-listing suppliers, post-auction negotiations, etc (Kaufmann and Carter 2004). The functionality of an online marketplace may allow for leveraging opportunities provided by such a context. For instance an online marketplace can maintain a catalogue of suppliers and a database of past transactions, enabling a buyer to locate suitable suppliers before starting an auction. The buyer can browse the database of accomplished projects or search through the suppliers' profiles in order to locate the necessary combination of skills or look for suppliers with the highest ranking and the best credentials. Without performing a search (and as a result, without selecting and inviting the appropriate suppliers to bid for her RFP) the buyer is running a risk that the best potential suppliers may choose not to bid for the project due to the costs associated with bidding (Snir and Hitt 2003) or simply will not be aware that the project is there. However, when invited to participate, the supplier would estimate more highly his probability of winning and may opt to bid. Electronic market theory states that at a market with heterogeneous goods the buyer incurs costs when searching for information on price and other product attributes (Bakos 1991, Bakos 1997). Even when IT keeps search costs low the buyer still invests her own time in performing the search. In relative terms the cost of one hour invested in searching can still be substantial compared to project value if the latter is at the level of several hundreds of dollars (the average project value in the data set in the study by (Snir and Hitt 2003) is just 2,240 (median value is 622.93)), which is often the case with small businesses. Performing a search for an optimal supplier is in line with common practices of procuring services in the IT industry. Before starting a tender the buyer locates, evaluates and selects suppliers for the bidding round. Preliminary selection is carried out by means of elaborate and hence costly procedures (Michell and Fitzgerald 1997).

(Bakos 1997) argues that a buyer performs a search for an optimal offering until she finds one that matches her requirements to a sufficient extent. Evaluation of every additional offer increases the buyer's search costs. This leads us to suggest that a buyer investing more in searching before the auction is more likely to locate a satisfactory offering than a buyer with lower or no search costs.

Hypothesis 1: *A buyer with higher search costs is more likely to award the contract than a buyer with lower search costs.*

2.2.2. The Buyer's preparation costs.

Snir et al., 2003 (Snir and Hitt 2003) provide a good summary of exchange characteristics of IT services (p 1505):

> "The RFP and bidding process must result in the exchange of much more information because projects and qualifications are not standardized. Unlike the trade of physical commodities where a part number, industry standard (e.g., MIS-SPEC, ANSI, ISO, etc.) or short description can be sufficient to fully describe a good required, IT services are highly customized, and idiosyncratic. Moreover, unlike many physical commodities that have objective tests of quality (e.g., composition, strength, reliability, etc.), IT services face subjective evaluation of the work product. As such, the range of possible characteristics and quality levels of services is virtually unlimited" (Snir and Hitt 2003).

Snir et al., 2003 make an implicit assumption that the costs of preparing a request for proposal (RFP) are negligible. In reality, developing specifications for IT services (e.g. web site development) is usually time-consuming and costly. In the IT industry, in particular in IT outsourcing, projects are typically idiosyncratic, complex and difficult to describe ex-ante (Banerjee and Duflo 2000). Similar to the construction industry, investing more in the request specification helps to avoid higher costs (due to project overrun) at a later stage (Banerjee and Duflo 2000). In their study of contracts in the construction industry (Bajari and Tadelis 2001) state that a more complete ex-ante design of a construction project imposes higher ex-ante costs, it is also important for avoiding costly ex-post negotiations (Bajari and Tadelis 2001).

At an online marketplace for IT services the efforts required for specifying a buyer's request can be idiosyncratic, or market-specific, as marketplaces can have proprietary RFP formats. At the marketplace we study the buyer is required to specify at least the project's name and provide a text description. The buyer can also attach additional files with drawings, screenshots, specifications, etc. Providing a detailed description (which is not necessary if the buyer and supplier meet personally or discuss the project over the telephone) involves costs for the buyer. This observation is in line with the findings from (Barua, et al. 1997) that communicating project details to suppliers creates additional costs for the buyer.

Explicitly specifying the request improves suppliers understanding of a buyer's needs, which can be highly idiosyncratic, and therefore contributes to the buyer's higher level of satisfaction with the results of the delivery stage.

We define preparation costs as investments incurred by the buyer to describe her project before starting a reverse auction. We suggest that committed buyers are more willing to make such investments and would therefore have higher preparation costs than opportunistic buyers. It is important to note, however, that preparation costs can be dependent on project complexity and size. We address this issue in the analysis section.

Hypothesis 2: *A buyer with higher preparation costs is more likely to award a contract than a buyer with lower preparation costs. .*

2.2.3. Buyer negotiation costs

The complex and idiosyncratic nature of IT services often results in a buyer not being able to assess her needs and specify the service requirements. A competent supplier may need to analyse the problem and propose a solution before the buyer commits to the transaction (Lovelock 1983). To make the specification more complete the buyer may also need to work closer with the potential supplier(s) (Banerjee and Duflo 2000).

During sourcing, including the bidding stage, the buyer can discuss the project with suppliers and update the specification along the way. Communicating project details and discussing them with individual suppliers imposes additional costs on the buyer. We denote these costs as negotiation costs.

By discussing project details with the suppliers the buyer is able to use suppliers' competence for developing an optimal way to deal with her project. The fit between suppliers' skills and buyer's needs is improved and the specification of the service is made more explicit and fitted to the competence of the bidding suppliers, which ensures a higher chance of being satisfied at the execution stage. Improved fit leads to a higher chance of project award. At the same time, opportunistic buyers are more likely to withdraw from the participation after seeing the bid prices and are less likely to engage in discussing and evaluating suppliers' feedback. We suggest that a buyer with higher negotiation costs is more committed to executing her project at the online marketplace.

Hypothesis 3: *A buyer with higher negotiation costs is more likely to award a contract than a buyer with lower negotiation costs.*

3. Empirical Analysis

3.1. Online market for IT services

We conduct the empirical investigation using transaction data from a leading online marketplace for professional services for small businesses. Established in 1998, the online marketplace now contains around one thousand simultaneously active projects across all service categories and data on tens of thousands of auctions completed to date. Around 60 thousand companies are regularly using the online marketplace for purchasing services and about half or more of them buy IT services[2]. The online market contains a searchable database of suppliers and uses reverse auctions as an allocation mechanism.

[2] http://www.informationweek.com/story/showArticle.jhtml?articleID=166401742

The range of services that can be procured encompasses IT services, as well as other professional services such as translation, creative writing, accounting, financial and business strategy consulting. Software application development is one of the most populated areas of the online marketplace. Buyers are businesses and individuals coming predominantly from the US, while suppliers are mostly freelancers, small and medium. IT outsourcing companies located in India, Eastern Europe and Russia. Some of the most active suppliers have a turnover of over USD 100 000 in accomplished projects over the recent six months and over USD one million over the whole time of their presence at the online marketplace.

The exchange process is organized as follows. Before buyers and suppliers are able to enter the exchange they are required to register at the website. Participation for buyers is free of charge while a periodic fee applies to suppliers. The buyer starts an auction by posting an RFP, which is a combination of mandatory and optional attributes that describe a project. The buyer also specifies auction parameters, such as start and end time, auction type and type of suppliers who can bid. After the RFP has been posted suppliers can submit their bids. Bidding can be either open or sealed. In sealed auctions parameters of bids are visible only to the buyer. For the present analysis we will focus on reverse auctions with open bidding, as sealed auctions do not reveal the information necessary for our analysis.

Suppliers periodically screen through the list of newly submitted RFPs. After a new RFP has been posted, suppliers can evaluate it and can submit their bids. A combination of mandatory (price, estimated delivery date, bidder's name and rating) and optional (verified credentials, attached files) attributes applies to the bid format. Once a bid has been submitted, it becomes visible to the buyer and other suppliers. The buyer has a number of options during the auctions stage. She can "decline" bids, which means deletion from the list of all submitted bids, shortlist bids or just select a winner before the end of an auction. In the meantime, the buyer and suppliers can communicate via private message boards, which are usually used for clarifying details of RFPs and bids and communicating other project-related information. All the communication through message boards is logged and can be used for arbitrage purposes in the case disputes which can emerge during the execution of settlement stage.

3.2. Methodology and Data

The data for the empirical tests were collected from the “Software and Technology“ sub-marketplace. This category includes 12 sub-categories: Application Development, Database Development, Enterprise Systems, Handhelds & PDAs, Linux, Networking, Other - Software & Technology, Scripts & Utilities, Security, System Administration, Technical Support and Wireless.

We obtained data on projects that started between January 26, 2005 and August 6, 2005 and ended not later than August, 8, 2005. Overall, 4,019 reverse auctions took place in the “Software and Technology” sub-marketplace during that period. This represents roughly 11% of all auctions at the online marketplace during the specified timeframe. A rather short timeframe for the auction data (between January 26, 2005 and August 6, 2005) was chosen because the marketplace is becoming increasingly popular, which makes shorter periods increasingly suitable for amassing a sizeable dataset.

Of 4,019 reverse auctions, 3,143 auctions contained information on the project value (i.e. the price of the winning bid or the final price paid by the buyer), which is a crucial control variable in our analysis, therefore the rest (mostly sealed auctions) were excluded from the dataset. Auctions of an “invite-only” type were also removed as they are usually conducted with one or two invited suppliers and are more similar to bilateral negotiations than to competitive auctions. There were 546 auctions of this type in our dataset, 82% of which ended up with awarded projects, which clearly suggests a different pattern of buyers’ behaviour in these auctions. Finally, a number of cases with extreme project values (below USD 100 and above USD 15000 – 41 auctions in total) and project description length (below 10 words - 196 auctions) were deleted from the dataset resulting in the final dataset of 2,574 auctions. Short project descriptions are, as a rule, not informative (e.g. “Please view attachment. Feel free to initiate contact with me using PMB“) or contain either very simplistic requests (“I want a website like yahoo.com”) or references to past projects meant for specific suppliers. The total value of the *awarded* projects in the final dataset of 2,574 auctions is USD 679,904.

Data from the same online marketplace were earlier used by Snir et al., 2003 for testing their hypotheses on the relationship between project value on the one hand and the number of bids and average quality of suppliers on the other hand. To ensure greater reliability and validity for our results we first carry out a partial reproduction of their results. Snir et al., 2003 found that higher value projects tend to attract more bids than lower value projects and that project value, auction length and project length are negatively associated with the award likelihood, while market maturity is positively associated with the award likelihood. Table 1 provides descriptive statistics for both datasets.

[Table 1 about here]

Out of 2,574 open reverse auctions analyzed in this study only 846 auctions or just 32.9% resulted in a contract between the buyer and the supplier (38% in Snir et al., 2003).

As seen in Fig 1, auctions for higher value projects are less likely to end up with an awarded contract. Only 18.0% of auctions for projects above USD 1500 end up with awards, while for auctions in the USD 500-1500 group the ratio is 28.9% and for projects below USD 500 – 44.6%.

The data on project length was not available at the marketplace at the time we performed data collection; therefore it was not possible to reproduce the effect of this variable on the award likelihood in our dataset. Table 3 presents the results of our efforts to reproduce the rest of the outcomes of the analysis in Snir et al., 2003. Model 3.1 is the base model that relates project value (v), market maturity (*M*), auction length (*T*) and project length (*P*) to the number of bids submitted at an auction. Two variables, average bid and project length were used in Snir et al., 2003 as proxies for the project value (we used only the first one in our tests for the reason explained above).

$$n_{b,i} = \beta_0 + \beta_1 \ln(v_i) + \beta_2 \ln(M_i) + \beta_3 \ln(T_i) + \beta_4 \ln(P_i) + \varepsilon_i \quad (3.1)$$

All these variables have a positive and significant effect on the award likelihood as the results of the regression analysis show (Table 2).

[Table 2 about here]

In our analysis market maturity was excluded from further equations, due to the fairly well-established nature of the market compared to the Snir et al., 2003 analysis (approximately seven years in operation at the time we were collecting data). Market maturity was nearly constant throughout our time window and did not produce any impact on the auction outcome. Therefore, the following equations were used to reproduce the effect on the number of bids and the likelihood of project award (logit) respectively:

$$n_{b,i} = \beta_0 + \beta_1 \ln(v_i) + \beta_2 \ln(T_i) + \varepsilon_i \qquad (3.2)$$

$$\Pr(A_i) = \beta_0 + \beta_1 \ln(v_i) + \beta_2 \ln(T_i) + \varepsilon_i \qquad (3.3)$$

R^2 values in our analysis are close to those in Snir et al., 2003. In their models for the number of bidders R^2 is 0.195. -2Log L statistics for the model for contract award in all open auctions (Snir and Hitt 2003) is 5,689.278 (N = 4,887) and 3,600.726 for auctions where the buyer has accomplished at least one project beforehand (N = 3,002).

The results of the analysis of the impact of project value and auction length on the number of bids and the likelihood of contract award (column 3.2, 3.4 and 3.5. in Table 2) are in line with those by Snir et al., 2003, see table 4 in their paper (p. 1516), also column 3.1 and 3.3 in Table 2. In both cases the effect of the project value and auction length is negative and significant. This shows that more bids are submitted for higher value projects and that higher value projects are awarded less often than lower value projects. The same analysis was performed on the dataset of 1,880 auctions, in which buyers awarded at least one project (Column 3.5). Again, the results conform to those of (Snir and Hitt 2003), see table 5/ Model 4 of their paper.

3.3. Measures for buyer's search, preparation and negotiation costs

Buyer's search costs

Invited buyers (*Inv*). In the event that a buyer has located a suitable supplier as a result of her search efforts she can invite the supplier to bid for her project. We suggest that inviting a supplier to an auction is an indication of search efforts undertaken by the buyer, since a buyer has to explicitly ask (and hence have searched for) suppliers to bid at the auction by sending a message of invitation. The presence of the invited buyer is indicated on the web pages with bidding details and is modelled as a dummy variable.

Buyer's preparation costs

Length of project description in RFP (*DLength*). Developing a detailed project description and/or specification involves costs for the buyer. We use the length of project description in words as a proxy for thebuyer's investment in specifying her request. A similar measure, the length of contracts in pages, has been used as a proxy for contractual complexity before in (Joskow 1988, Poppo and Zenger 2002)

Attached files (*Att*). A buyer can supply additional project details in files attached to the RFP. Examination of around two hundred auctions revealed that attached files tend to contain mostly extended text descriptions, samples of programming code, drawings etc. This indicates additional efforts invested by the buyer in detailing her request. We consider attached files as evidence of investments in the request specification and create a dummy variable for that.

Buyer's negotiation costs

Communication (*Com*). Communication between buyers and suppliers is enabled via a message board, which becomes available for posting messages as soon as supplier has submitted his bid. Suppliers often refer to the communication via the message board when updating their bids. By examining two hundred auctions we identified five most widely used ways to refer to the message board discussions in suppliers' bids' text. These are phrases "as per PMB", "as agreed", "thank you for your answer", "as per discussion", or "as discussed". The presence of communication is modelled through a dummy variable, based on whether or not one or more of the bidders used the indicated phrases in their bids.

Declined bids (*Decl*). When reviewing submitted bids the buyer has an option to "decline" some of the bids, which means deleting them from the list of bids. We consider declined bids as evidence of the buyer's evaluation efforts to select an optimal offer by analyzing bids and excluding those that do not satisfy her utility function. Therefore, the second proxy for buyer's negotiation costs is the presence of declined bids, modelled again through a dummy variable.

Constructs and variables involved in our hypotheses are presented in Figure 2.

[Figure 2]

3.4. Data Analysis and Discussion

Table 3 shows the cross-correlations between the variables in the models, which exhibit no initial signs of multi-collinearity issues. The directions of partial correlations with the dependent variable 'Contract Awarded' (in bold) are in line with the theoretical expectations.

[Table 3 about here]

We formally test our hypotheses with a logit regression model, similar to the one used by Snir et al., 2003. We did not include the project length and market maturity in our model, as discussed above, instead we extend their model by including five variables operationalizing buyer's costs: declined bids, re-bids, quality of project description, attached files and invite-only auction type. This results in the following model (4):

$$\Pr(A_i) = \beta_0 + \beta_1 \ln(v_i) + \beta_2 \ln(T_i) + \beta_4 \ln(DLeng_i) + \beta_3 Att + \beta_5 Com + \beta_6 Decl + \beta_7 Inv + \varepsilon_i \quad (4)$$

The results of the regression analysis are presented in Table 4, column 2. The first column contains the results of logit regression analysis of the entire dataset. As seen from Table 4, all coefficients are significant at the level $p<0.01$ or $p<0.05$ and in the direction specified by our hypotheses 1-3. This thus lends support to our predictions that buyers investing more in the search, preparation and negotiation phases of the sourcing process, are more likely to award the contract than buyers who invest comparatively little. The increase in Nagelkerke R^2 from 0.155 to 0.232 in comparison with model 3.2 indicates that the inclusion of the variables that operationalize buyer's costs into the analysis results in an improved model fit and hence a better understanding of the factors driving contracting behaviour at the online marketplace for IT services.

[Figure 1 about here]

Next, we investigate whether the findings on the role of buyer's commitment hold across projects of different size and complexity. One can argue that the level of buyer's costs, especially preparation and negotiation costs depends on the size and complexity of the project. Using project value as a proxy for project size and complexity we now investigate the effects of the three types of costs across different project value groups (columns 3-5 in Table 4). The auctions are split into groups according to the project value: below 500 USD, between 500 and 1500 and above 1500, just as in Figure 1.

[Table 4 about here]

Generally, the results of the test suggest that the findings on the effect of buyer's costs on the award likelihood hold across groups of projects of varying size and complexity. Most of the coefficients for the key variables retain their signs and significance. There are several observations to be made, though. First, with projects below USD 500 the coefficient of roject value is positive (which contrasts with previous models) and not significant; this might mean that the relative value of a project is not that important for the award decision for the low value project group. Second, the explained variation of the models is lower for higher-value project groups: Nagelkerke R^2 changes from .219 to .146 to .165 as the project value increases. It seems likely that some unobserved mechanisms regulating buyer's award behaviour are playing an increasing role when the project volume goes up. Third, project description length is positive but not significant in 500 to 1500 and above 1500 groups. The coefficient for attached files maintains the sign but is not significant in the highest value projects group. Perhaps, buyers with more expensive projects are reluctant to fully reveal   information in open access and provide additional details only to short-listed suppliers after seeing their qualifications and initial bids. Another insight is that, across the three value groups, the effects of the buyer's search and negotiation costs on the award decision appear to be more robust than the effects of preparation costs, with coefficients for communication, declined bids and invited suppliers being always highly significant and higher than coefficients for attached files and description length.

Next, in order to understand whether learning affects a buyer's award behaviour we look at search, preparation and negotiation costs across groups of buyers with different numbers of projects awarded at prior auctions (Table 5). One could expect that as their experience grows, buyers can develop more efficient ways to manipulate the three types of costs in order to achieve optimal allocation, e.g. by communicating with suppliers more intensively during the auction rather than investing resources into RFP preparation. Or the buyers could learn to minimize the overall level of costs, in which case we would see the three costs as having smaller and less significant coefficients. We test model (4) on two groups of buyers: those who have actually awarded less than 5 and over 10 auctions. See Table 5.

[Table 5 about here]

Testing the hypotheses on the group of buyers who awarded over 5 of 10 projects enables us to control for "naivety", which can be a property of some of the new buyers. Clearly, these are experienced buyers who adhere to their buying strategies in a more rational way than buyers who posted one or just a few RFPs. We can see that the major findings hold for the non-naive, or experienced buyers.

Interestingly, the results of the analysis in Table 5 show that the coefficients for the costs variables of more experienced buyers tend to be higher than with less experienced buyers, which means the effect of these costs becomes stronger with more experienced buyers. Moreover, buyers' contracting behaviour becomes more predictable as their experience grows, which is illustrated by a substantial increase of Nagelkerke R^2, from .203 for buyers who awarded less than five projects to .335 for buyers who awarded more than 10 projects. This shows that the behaviour of more experienced buyers tends to be less opportunistic and more predictable[3].

4. Conclusions and Further Research

The contribution of this paper is three-fold. First, it sheds additional light on contracting practices at online marketplace for IT services through the in-depth investigation of buyer's behaviour with regard to awarding projects. We do this by distinguishing between two groups of buyers at the online marketplace – buyers committed to enter the exchange and those who are inherently unwilling to award projects to suppliers – and discuss the implications of the differences in their behaviour. We have identified the structure of costs buyers incur during the sourcing process and found a positive relationship between the level of

[3] Testing for buyers who posted, rather than awarded, less than 5 and over 10 projects produced similar results.

search, preparation, and negotiation costs incurred by the buyer and the likelihood of the contract award at a reverse auction. We have also argued that the higher level of these costs distinguishes committed buyers from opportunistic (or naïve) buyers. As a result, the nature of factors that influence the efficiency of such marketplaces becomes clearer.

Additionally, the examination of the effect of project size and complexity and the buyer's level of expertise revealed that, in particular, the effects of most of the costs on contracting behaviour hold across different project value groups and that the behaviour of more experienced buyers tends to be more predictable in terms of more consistent investments in search, preparation and negotiation.

The second contribution concerns the literature on exchange opportunism. Unlike most of the extant studies that deal predominantly with opportunism at the contract execution stage (ex-post opportunism) and regard suppliers as the primary candidates for exhibiting opportunistic behaviour, this study focuses on the role of buyers' ex-ante commitment and opportunism in contracting for IT services. We find that a buyer's opportunistic behaviour, whether it is practiced for information-gathering purposes such as price benchmarking and obtaining free consultations, or caused by the buyer's naivety, is a key reason why a considerable proportion of reverse auctions at online marketplaces for IT services do not result in awards, resulting in the wasted efforts of suppliers.

Third, some authors (Barua, et al. 1997, Snir and Hitt 2004, Snir and Hitt 2003) argue that an important condition for the increase of online markets' efficiency are entry barriers for inefficient suppliers. Our research shows that online market efficiency might increase if entry barriers are set up for inefficient *buyers* too, e.g. for those who use the online market primarily for price benchmarking or obtaining a free consultation. This also highlights the fact that for the market maker, entry barriers are a double-edged sword: low barriers are necessary to achieve critical mass, but high barriers are more conducive to transactions being carried out successfully, yet both are necessary for a marketplace to survive in the long run. Further research could investigate the optimal level of entry barriers throughout the various phases of market maturity.

The above findings do not come without limitations. First, our reasoning and models are based on an implicit assumption that at an online marketplace for IT services a committed buyer will find a matching supplier if she invests sufficiently in search, preparation and negotiation. Although in reality this might be true to a large extent as there is a vast variety of suppliers at such electronic marketplaces[4], there is always room for situations where the buyer would underestimate the value of the project or due to some internal or external factors the project lose relevance over the auction duration, which is normally one or two weeks. These types of situations naturally affect the award behaviour of committed buyers and are likely to be one of the reasons for the relatively low explanatory power of our models.

Second, we study data from a single, albeit a leading, online marketplace for IT service for small and medium companies, whereas there are other marketplaces, where reverse auctions and other value-added processes are designed somewhat differently. This poses a limitation to the generalisability of the findings, which we plan to overcome by analysing transaction data from another leading marketplace for IT services in the near future.

Third, we did not consider an important type of auctions, invite-only auctions, which account for almost half of the monetary turnover of the Software and Technology sub-marketplace during the focus period. The motivation and behaviour of buyers using this type of auctions deserve further dedicated research efforts.

Fourth, our findings concern mostly small and medium companies, which are believed to be the primary buyers at the online marketplace. One can expect that the sourcing behaviour of larger companies would be more rational. Similarly, although one might expect to find similar behaviour among buyers of other types of professional services, such as Creative writing or Marketing consulting, it is a question to exactly what extent these findings would be applicable across other categories of professional services.

Finally, we have treated the IT services buyers as two homogeneous groups. In reality, the buyers can be much more heterogeneous that that. One can expect to find different patterns of buying behaviour at such

[4] For example, according to the information at Rent-a-coder.com over 120 thousand software developers are registed at this online marketplace as per November 2005.

online marketplaces, e.g. when buyers first test the reaction of the market to their request at one auction, updating their specifications and expectations; then they come back later with the same project and do actually award it at the second auction. Investigation of such repeated patterns in buyers' behaviour is a promising area for further research.

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Figures

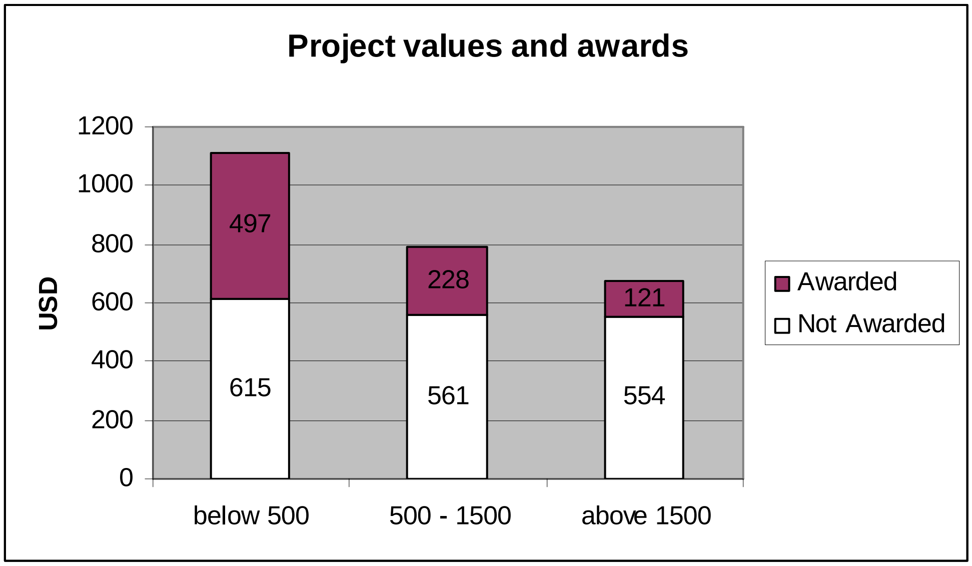

Fig. 1. Distribution of auctions groups per project value.

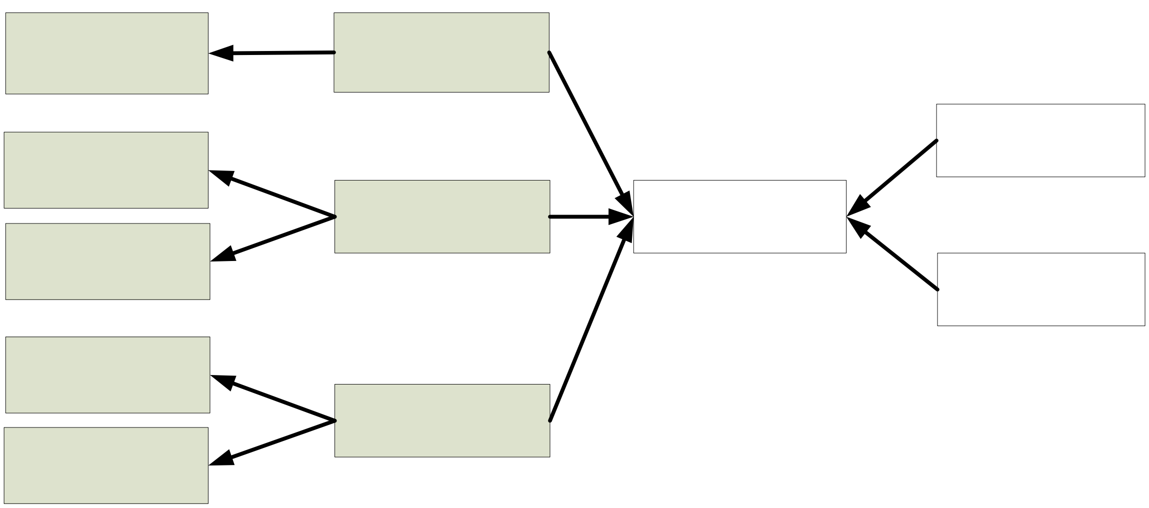

Figure 2. Hypotheses, constructs and variables.

Tables

Table 1. Descriptive statistics from Snir et al., 2003 and the present study.

	No. of observa-tions		**Mean**		**Standard error**		**Median**	
	Snir et al, 2003	Present study	Snir et al 2003	Present study	Snir et al 2003	Present study	Snir et al 2003	Present study
Number of bids	4,887	2,574	15.1	9.37	13.25	8.00	11	7.00
Average bid, USD	4,887	2,574	2,240	1,301	6,785	1,787	594	623
Auction length, days	4,887	2,574	9.2	7.20	10.05	8.54	7	4.00
Project length, days	4,887	n/a	38.9	n/a	68.16	n/a	21	n/a
Average feedback (scale 0-5)	2,938	2,574	4.6	4.61	0.431	.795	4.7	4.8
Contract awarded	4,887	2,574	0.38	0.33	0.485	0.47	0	0
Winning bid, USD	1,828	846	787	780	2,861	1735	200	291
Preferred vendor	4,109	n/a	0.37	n/a	0.353	n/a	0.29	n/a
Preferred project	4,832	2,574	0.12	0.017	0.328	0.13	0	0
Declined bids	n/a	2,574	n/a	0.19	n/a	0.39	n/a	0
Communication	n/a	2,574	n/a	0.07	n/a	0.08	n/a	0
Length of project description, words	n/a	2,574	n/a	146	n/a	114	n/a	115
Attached files	n/a	2,574	n/a	0.21	n/a	0.41	n/a	0

Table 2. Reproducing results of the analysis from Snir and Hitt 2003.

Dependent variable	**3.1. Snir et al., 2003 (No. of bids)**	**3.2. Our dataset (No. of bids)**	**3.3. Snir et al., 2003 (contract award)**	**3.4. Our data-set (contract award)**	**3.5. Our dataset (contract award / only buyers with previously awarded projects)**
	Value (S.E)	Value (S.E)	Value (S.E)	Value (S.E)	Value (S.E)
Constant	-19.83*** (1.598)	-5.159*** (.818)	3.15*** (.303)	2.305*** (.254)	2.685*** (.291)
ln(average bid)	1.65*** (0.117)	1.798*** (.131)	-0.25*** (.023)	-.310*** (.041)	-.274 *** (.47)
ln(auction length)	3.90*** (0.236)	1.785*** (.179)	-0.87*** (.048)	-.685*** (.057)	-.901*** (.063)
ln(market maturity)	2.44***(0.248)	n/a	-0.15*** (.046)	n/a	n/a
ln(project length)	0.74***(0.224)	n/a	0.14*** (.043)	n/a	n/a
N	4,887	2,574	4,887	2,574	1880
Adjusted R^2	0.195	0.139	n/a	0.155 (Nagelk-erke R^2)	0.235 (Nagelkerke R^2)
Regression F-stat for 3.1 / -2Log L for 3.3	295.85 (Regres-sion F-stat)	207.504 (Regression F-	5,699.278 (-2Log L)	3131.022 (-2Log L)	2202.625 (-2Log L)

- 3.5 stat)

Table 3. Correlation matrix.

	No. of bids	**Avg. bid**	**Auct. Durat.**	**Award**	**Declnd bids**	**Com-munic.**	**Length descrp.**	**Attach**	**Invited suppliers**
No. of bids	1								
Average bid	.255***	1							
Auction duration	.202***	.116***	1						
Contract awarded	-.061***	-.195***	-.146***	1					
Declined bids	.188***	.081***	.072***	.062***	1				
Commu-nication	.105**	.-027	.010	.160***	.019	1			
Length of descrip.	.020	.081***	.056***	.028	.087***	.019	1		
Attached	.010	.026	.009	.091**	.050**	-.012	.097***	1	
Invited suppliers	.017	.009	.021	.102***	.074***	.030	.075***	.051***	1

*p<0.1, ** p<0.05; *** p<0.01

Table 4. Testing hypotheses on buyer's preparation and negotiation costs; testing bidding behaviour across different project value groups.

Variable	**All projects**	**Values < 500 USD**	**Values =< 500 and < 1500 USD**	**Values >= 1500 USD**
Constant	1.535*** (.000)	1.271 (.818)	4.295** (1.868)	5.348** (2.072)
ln(average bid)	-.402*** (.000)	.049 (.136)	-.594** (.262)	-.653*** (.229)
ln(auction length)	-.744*** (000)	-.745*** (.071)	-.495*** (.103)	-.668*** (.136)
Attached files	.458** (.000)	.371** (.163)	.647*** (.192)	.388 (.244)
Ln(description length)	.201***(0.002)	.249** (.098)	.140 (.115)	.203 (.142)
Communication	1.274*** (.000)	1.328*** (.276)	1.310*** (.263)	.901*** (.301)
Declined bids	.655***(.000)	.639*** (.197)	.515*** (.196)	.821*** (.232)
Invited suppliers	.500*** (.000)	.344** (.149)	.442** (.180)	.673*** (.217)
N	2,574	1112	789	673

-2Log L	2815.173	1330.087	863.913	562.459
Nagelkerke R^2	0.232	.219	.146	0.165

*p<0.1, ** p<0.05; *** p<0.01

Table 5. Testing the effect of buyers' experience on the award likelihood.

Variable	**Awarded projects**	
	<5	**>10**
Constant	2.392*** (.543)	4.135*** (.880)
ln(average bid)	-.283*** (.059)	-.571*** (.099)
ln(auction length)	-.676*** (.073)	-.676*** (.105)
Attached files	.345** (.144)	.708*** (.246)
Ln(description length)	.230*** (.086)	.351** (.148)
Communication	1.364*** (.218)	1.218*** (.348)
Declined bids	.696*** (.154)	.764*** (.276)
Invited suppli-ers	.513*** (.132)	.648*** (.234)
N	1558	546
-2Log L	1571.954	584.369
Nagelkerke R^2	.203	.335

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