Coping with Costly Bid Evaluation in Online Reverse Auctions for IT Services

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Online markets have dramatically decreased costs of search and communication for buyers. By contrast, costs of evaluating purchasing alternatives have become critical due to an overwhelming range of available options. When high, evaluation costs can offset potential gains from transactions and cause inefficiencies, e.g. by forcing buyers to abandon transactions without allocating contracts. While most previous studies treat evaluation costs as an exogenous factor, this study considers them endogenous. We identify several tactics (search, request for proposal preparation, budget announcement, bid filtering, and negotiation) that buyers at online markets can use to reduce their evaluation costs and hence influence project allocation. Using data from nearly 10 thousand transactions at a leading online marketplace for IT services, we show that buyers who use these tactics are more likely to allocate their project to a winner than buyers not using these tactics. Buyer experience also has a positive effect on allocation and, in addition, moderates the effectiveness of some of the tactics. As experience grows, budget announcement becomes more effective in coping with evaluation costs and increases the likelihood of allocation, while the effectiveness of request for proposal preparation decreases. Together, these results shed more light on the buyer side of online reverse auctions, which leads to guidelines for improving the efficiency of online marketplaces.

Keywords: evaluation costs, reverse auctions, online markets, IT services, outsourcing, buyer behavior, vendor selection.

1. Introduction

While the sale of physical products over the Internet has been a mainstay of electronic commerce, in recent years a number of online marketplaces have sprung up that focus on the trading of professional services. They cover services from IT (e.g. website design) to construction (e.g. painting) and from tax advice to creative writing. One of the more vivid examples is Elance Online, a pioneer professional services marketplace that runs around 100.000 reverse auctions for services[1] yearly. Another example is RentACoder.com, a marketplace specialized in IT services, that facilitates over 15.000 projects per month and still grows at the rate of 50% a year[2]. The field is booming, with more newcomers such as oDesk and OnForce joining the game (Thibodeau, 2007).

The growth of these markets has dramatically increased the range of alternatives that are available to buyers. For example, when considering sourcing a service at RentACoder.com, a buyer potentially has over 160 thousand vendors from close to 200 countries to choose from. The exposure to an overwhelming range of suppliers and their offerings online can require buyers to spend more efforts on evaluating their options (Barua, Ravindran, & Whinston, 1997: 119), thus increasing the cost of transacting and reducing the efficiency of online marketplaces. Bid evaluation is particularly challenging when heterogeneous services such as software development are involved, where the services is typically idiosyncratic and substantial information asymmetry exists with regard to vendor quality and production costs (Snir & Hitt, 2003). In addition, sellers have responded to lowered search costs with strategies that make the evaluation more complex – by increasing product differentiation (Clemons, Hann, & Hitt, 2002; Grover & Ramanlal, 1999), product bundling and multiproduct competition (Ellison & Ellison, 2005). Thus, the bid evaluation process is a non-trivial part of the exchange process at online marketplaces, yet only a handful of studies have recognized its importance.

[1] www.elance.com (accessed 25.06.2007)
[2] www.rentacoder.com (accessed 25.06.2007)

This importance is demonstrated by a connection between higher evaluation costs and buyer's tendency to abandon the transaction, i.e. not allocate the project to any vendor at all (Carr, 2003; Snir et al., 2003). From a buyer's perspective, as the expected costs of evaluating vendors or their offerings go up, at some point they may overweight the benefits of locating an efficient vendor, so that the buyer decides to forgo bid evaluation and quits the transaction (Carr, 2003). Empirical tests supported this conjecture by showing that as project value and the number of submitted bids increase, a buyer becomes less likely to allocate their IT projects at reverse auctions (Snir et al., 2003). High evaluation costs at least partially account for the fact that as little as 30-40% of requests for proposals at marketplaces such as Elance Online go past the bidding stage to the project award stage (Snir et al., 2003). Thus, understanding evaluation costs and perhaps more importantly, the ways to cope with them, is important in order to harness the complexities and opportunities of online marketplaces. As Barua at al. (1997) put it: "Unless buyers have effective supplier evaluation strategies, it may not be possible to unlock the full potential of the technology" (Barua et al., 1997: 119).

Evaluation cost reduction is likely to increase the efficiency on the individual and market levels. Prior studies suggested marketplace design improvements and automatic evaluation tools to reduce evaluation costs (Barua et al., 1997; Snir et al., 2003). The present study adds to these institutionally-focused factors another category of factors that impact evaluation costs – the behavior of the buyer in the marketplace. Whereas previous studies regarded the buyer's behavior as uniform and fixed, we argue that buyers have several tactics as their disposal that they can employ to reduce evaluation costs. Hence our main research question is:

> "*What is the effect of evaluation-cost-reducing buyer tactics on project allocation at online marketplaces for IT services?*"

The tactics we address are *search, RFP (research for proposal) preparation, budget announcement, negotiation and bid filtering*. The discussion of these tactics is inspired by practices that exist in custom software de-

velopment, empirical observations at online marketplaces as well as by the literature. Note, however, that these tactics are not exclusively used for evaluation cost reduction. For example, preliminary search for qualified vendors in the marketplace is widely used in many procurement settings in order to reduce project risk, while providing a clear project specification in an RFP is necessary to ensure the vendors will be able to place better-informed bids (Milgrom & Weber, 1982) and to avoid ambiguities during project execution. However, we will argue that an important effect of these tactics is to reduce the evaluation costs, which has thus far escaped recognition in the literature. Thus, the focus of our study is on the implications these tactics have for evaluation costs and the impact on project allocation in the context of online IT service marketplaces. Additionally, we take into account the role of buyer experience in order to assess if the effectiveness of these tactics changes as experience grows.

In order to answer the research question, we conduct a quantitative examination of transactions from a leading online IT services marketplace. The dataset comprises approximately 10,000 reverse auctions. The results demonstrate that buyers employing the aforementioned tactics allocate projects more often than buyers who do not, as each separate tactic contributes significantly to project allocation. Buyer experience moderates the effectiveness of some of the tactics: as experience grows, budget announcement becomes more effective in increasing the likelihood of allocation, while RFP preparation becomes less effective.

The results of the analysis provide support for our conjectures that buyer tactics are an effective means for coping with evaluation costs. These findings contribute to the bodies of literature on online marketplaces and auction theory by increasing our understanding of the relationship between buyer behavior, evaluation costs and contracting decisions at reverse auctions within online marketplaces.

The paper is organized as follows: Section 2 contains a review of literature on online markets and reverse auctions. Section 3 presents the conceptual set up and hypotheses. In Section 4 we describe the empirical setting of an online marketplace for IT services, introduce measures and present the results of empirical tests. Section 5 and 6 contain the discussion and conclusions.

2. Background literature

2.1. Evaluation costs at online markets

An online market is defined as "an interorganizational information system through which multiple buyers and sellers interact to accomplish one or more of the following market-making activities: identifying potential trading partners; selecting a specific partner, and executing the transaction" (Choudhury, Hartzel, & Konsynski, 1998). Since the early days, the costs borne by actors in economic transactions were central to the literature online markets. Information and communication technologies were predicted to have drastic transaction cost-reducing effects, resulting in numerous implications for organizational forms, market efficiency and buyer and supplier behavior (Bakos, 1991; Malone, Yates, & Benjamin, 1987; Malone & Laubacher, 1998). Specifically, at the level of buyers' and sellers' strategies the implications of search costs (Bakos, 1997), bidding costs (Snir et al., 2003) and evaluation costs (Barua et al., 1997; Carr, 2003) were analyzed.

The literature on evaluation costs, which is the focus of our study, is represented by a limited number of studies. Barua et al. (1997) were the first to address the evaluation cost issue in online markets, where the range of purchasing options for heterogeneous goods and services is greatly increased. They compared two buyer strategies that are both aimed at reducing total costs of selection a vendor of a nonstandard product, namely a sequential evaluation strategy and a competitive bidding strategy (i.e. simultaneous evaluation). The authors analytically show that buyer's expected total

cost under sequential strategy is always equal or lower than that of the bidding strategy (Barua et al., 1997). An alternative way to approach evaluation costs was proposed by Snir and Hitt (2003) who focused on bidder behavior in online markets and show that higher value projects attract more bidders, and these bidders are of lower average quality (Snir et al., 2003). In response, Carr (2003) developed an analytical model in which bid evaluation costs are a function of the number of submitted bids and their average quality. As the number of bids increases, evaluation costs can become prohibitively high, so that the buyer may decide to forego bid evaluation and withdraw from the auction altogether (Carr, 2003). This observation that evaluation costs impact project allocation is the starting point for our paper and our first contribution is that we show that buyers can and do use tactics to reduce these evaluation costs, thus increasing project allocation rates and improving market performance. Our second contribution is to provide further support for the recently emerging stream of empirical literature on online auctions that takes into account the heterogeneity of market participants (Bapna, Goes, Gupta, & Jin, 2004; Jap, 2007; Radkevitch, van Heck, & Koppius, 2006; Zhong & Wu, 2006).

3. Conceptual Development

3.1. Context: online marketplace for IT services

Since our hypotheses are to some extent contextualized within the specific online marketplace we study (an issue we will address at the end of the paper in the generalizability of the results), we first introduce the research context – an online marketplace for IT services. Such marketplace is an ideal environment for our research. IT services, such as custom software development, are typically idiosyncratic, customizable and characterized by high information asymmetry with regard to vendor quality (Snir et al., 2003) and production costs (Whang, 1995); therefore, these services are likely to

entail substantial bidding and bid evaluation costs for the exchange counterparts (Snir et al., 2003). Snir and Hitt (2003) provide a clear summary of exchange characteristics of IT services:

> *"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 et al., 2003: 1505).*

Examples of online marketplaces that see an increasing number of contracts for IT service include eWork.com, Elance Online, RentACoder.com and oDesk. Contracts at these marketplaces are normally allocated via reverse auctions or bilateral negotiations (Jap, 2002; Kaufmann & Carter, 2004). These marketplaces also provide a platform for value-added exchange processes beyond the auction, such as payments, risk mitigation and service delivery (Kambil & van Heck, 2002; Snir et al., 2003). Due to a considerable number of small businesses and individuals outsourcing their work to low-cost countries through these marketplaces, this segment is sometimes referred to a "person to person offshoring". The volume of this market segment is projected to increase from around USD 250 million now to USD 2 billon by 2015 (Aggarwal, 2007).

We illustrate the functioning of such marketplaces with the example of Elance Online – one of the largest online marketplace for professional services. Established in 1998, Elance now hosts around two thousand projects that are simultaneously open for bidding across all service categories at any moment of time. Around 60 thousand companies regularly use the marketplace to buy services and

about half or more of them buy IT services[3]. The online market contains a searchable database of vendors and offers reverse auctions and negotiations as allocation mechanisms.

The range of services available at Elance encompasses IT services, as well as other professional services such as translation, creative writing, accounting, financial and business strategy consulting and the like. Buyers are businesses and individuals coming predominantly from the US. Vendors are mostly freelancers, small and medium IT companies from India, Eastern Europe and Russia. Some vendors have a turnover of more than USD two million within Elance.

The exchange process is organized as follows: before buyers and vendors are able to enter the exchange, they are required to go through a registration process. Participation for buyers is free of charge while a periodic fee applies to vendors. The buyer starts an auction by posting an RFP. The buyer specifies auction parameters, such as start and end time, auction type and the type of suppliers who can bid.

After the auction starts, vendors can bid. Bids specify price and estimated delivery time, contain information on vendor rating and earnings and a text field where the bidder can provide other relevant information. Once a bid has been submitted, it becomes visible to the buyer and other vendors. During the auction, the buyer can decline or shortlist bids and communicate with vendors via message boards.

There is no obligation for the buyer to allocate the project to any of the vendors, which results in quite a low project allocation rate of 30-40% (Snir et al., 2003). When a project is allocated, the parties can use a virtual "working space" to communicate, exchange documents, track milestones, and settle payments via an escrow account. Upon project completion, the buyer can assign a rating to the vendor.

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

3.2. Costly bid evaluation in the market for IT services

As discussed above, the exchange of IT services is likely to entail substantial evaluation costs. Evaluation costs are defined as "*the cost of resources used to scrutinize possible voluminous bid documentation or proposals from sellers, to assess the capability of each seller, and to compare prices and other aspects of the proposals*" (Barua et al., 1997: 123). The level of evaluation costs depends on the products or services involved – it goes up when they are nonstandard, customizable and idiosyncratic (Barua et al., 1997; Snir et al., 2003). Additionally, as the number of inefficient suppliers in the pool increases, the buyer's total evaluation costs also go up. These high evaluation costs in turn burden the exchange process with inefficiencies. Evaluation costs can grow as high as to "offset any gains from the reduced cost of search and communication" (Barua et al., 1997: 124) and "perfectly acceptable bids" can be neglected by the buyer due to high expected evaluation costs (Carr, 2003: 1521). Carr's (2003) model specifically addresses the exchange at online marketplaces for IT services. In this model the buyer starts a reverse auction by posting a request for proposals (RFP) to an auction site. Heterogeneous (in quality) vendors evaluate the RFP and decide, wither or not to submit their bids. When the auction ends, the buyer decides whether or not to undertake costly bid evaluation, which is necessary to determine the best vendor. The evaluation costs are incurred to assess vendor quality, which is private information. The model assumes that the buyer evaluates all bids or none. The buyer's decision whether or not to evaluate bids is a function of the number of submitted bids and the distribution of the vector of bids. With this information, the buyer can estimate conditional probability distribution of the lowest bid and calculate his expected post-evaluation surplus, which determines the optimal evaluation decision. The implications of this model have to be considered in the context of the insights from the model of costly bidding (Snir et al., 2003). In this model, higher value projects attract more bidders, and the average quality of these bidders becomes lower. As the buyer faces more bids,

which are of lower average quality, he is likely to forego the evaluation due to high expected costs (Carr, 2003).

3.3. Coping with evaluation costs

The previous paragraph highlighted the importance of evaluation costs for buyers, but there are several tactics that buyers can employ to reduce their evaluation costs. The discussion of these tactics is inspired by practices that exist in the field of custom software development, by empirical observations at online IT marketplaces as well as by the literature (Elmaghraby, 2007; Kaufmann et al., 2004). In the discussion of the tactics we assume that in procurement situations reverse auctions are embedded into a sourcing context that encompasses activities such as search for vendors, short-listing suppliers, post-auction negotiations, etc (Kaufmann et al., 2004). The tactics we consider are search (for vendors), RFP preparation, budget announcement, bid filtering and negotiation with vendors. Figure 1 depicts these tactics placed along the timeline of a typical reverse auction event at online IT service marketplaces. The displayed sequence is rather indicative, as in a real situation the buyer can decide to search for more vendors after auction start or award his contract prior to the scheduled auction end.

Such tactics are widely used in procurement (Elmaghraby, 2007; Nam, Rajagopalan, Rao, & Chaudhury, 1996) and do not exclusively serve for the evaluation cost reduction[4]. Indeed, preparing a clear project description in an RFP is necessary to make sure the vendors will be submitting bids for the right project; in B2B transactions identifying qualified suppliers in advance is important as the scale of transactions greatly exceeds that of the retail transactions (Barua et al., 1997; Pinker, Seidmann, & Vakrat, 2003), therefore search is commonly used in many procurement settings (Pinker et al., 2003);

[4] This raises the issue of alternative explanation of the effects of these tactics. The alternative explanations are addressed in the Discussion section.

budget announcement usually takes the form of an auction reservation price (Bakos, 1997); screening vendor and/or their offers (which we denote bid filtering) as well as negotiations are necessary steps in tenders to ensure the fit between the project and selected vendors (Mithas & Jones, 2007).

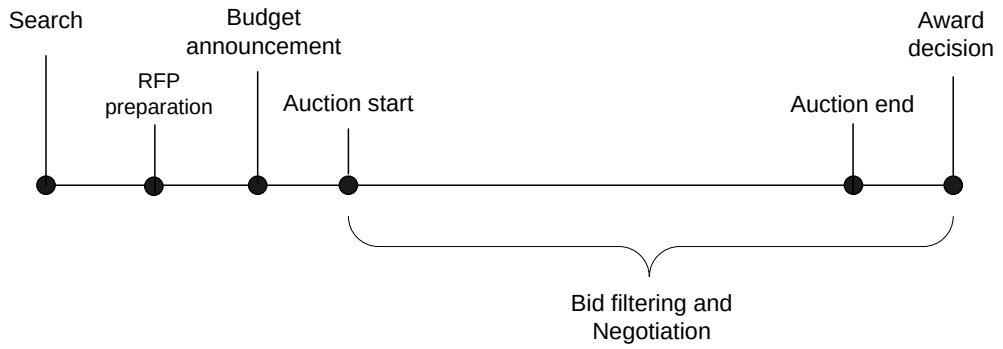

Figure 1. The use of buyer tactics along the timeline of the sourcing process at an online marketplace for IT services.

In order to facilitate the theoretical discussion, we draw a distinction between two aspects of evaluation costs: *the cumulative cost* and *the unit cost*. The cumulative cost of evaluation goes up with assessment of every additional vendor or bid. This is the overall cost the buyer incurs for evaluating all bids in the auction in the models by Barua et al (1997) and Carr (2003) and in the sequential strategy in Barua et al (1997). The unit cost of evaluation is the amount of resources and efforts invested by the buyer to evaluate a fixed amount of information, e.g. quality of a single vendor or bid. By increasing evaluation efficiency the buyer can reduce the unit cost of evaluation. In Carr's and Barua et al.'s analytical models, the unit cost of evaluation is strictly exogenous, while in the present study we hold both aspects of evaluation costs endogenous, so in our setting the buyer can influence both aspects of evaluation costs through the use of several tactics, which influences the total costs he incurs at the evaluation stage.

Below we discuss effects of the five buyer tactics on two aspects of evaluation costs within the context of an online auction for IT services. Through their impact on evaluation costs, the tactics and

experience affect the contracting decision, i.e. whether to allocate a contract to a vendor or not. As it is difficult to observe actual evaluation costs empirically outside a laboratory setting, we therefore focus on the direct implication of evaluations costs as described in previous literature (Barua et al., 1997; Carr, 2003; Snir et al., 2003) – the relationship between the use of tactics (potentially moderated by experience) and the likelihood of project allocation.

3.4. Hypotheses

Search for vendors

The functionality of an online marketplace often allows for leveraging search in an extremely cost-effective fashion. The buyer can browse the database of accomplished projects or search through a catalogue of vendor profiles in order to locate the necessary skills or vendors with the highest ranking. Once located, vendors can be personally invited to bid.

The motivation to perform search before the auction is as follows. The buyer is running a risk that efficient vendors may choose not to bid due to high expected bidding costs (Michell & Fitzgerald, 1997) or simply will not be aware of the opportunity. When invited personally, the vendors are likely to have a higher estimation of their own probability to win and would be more likely to bid.

There are two ways in which search can reduce buyer's cumulative evaluation costs. First, when inefficient suppliers decide whether to submit their bids, the presence of already submitted bids from their more efficient (and invited) counterparts may prevent them from so (Snir et al., 2003). Second, in case invited suppliers accept buyer's invitation and submit their bids, the buyer might subsequently focus on bids from these vendors (and ignore other bids) as the invited vendors have been already favorably assessed at the search stage.

As evaluation costs decrease in the result of search, the likelihood of buyer deciding to forego evaluation also decreases. There, we formulate our first hypothesis:

Hypothesis 1. More search for vendors will increase project allocation likelihood.

Budget announcement

The use of the announcement mechanism was suggested by (Carr, 2003) to enable the buyer to minimize evaluation costs when using the bidding mechanism. By the means of announcement mechanism the buyer "sets a minimum acceptable level of attributes such as delivery time, service backup and maintenance requirements, coupled with a maximum acceptable price" (Barua et al., 1997: 130). It is expected that inefficient suppliers will refrain from submitting their bids once high quality/price requirements are announced. Announcement mechanism "can induce a separation between "efficient" and "inefficient" suppliers" (Barua et al., 1997: 130). Reducing bidding from inefficient vendors results in lower cumulative evaluation costs for the buyer.

Online service marketplaces use a particular instance of announcement mechanism – they provide buyers with an option to declare the range of budget they expect to spend on the project. Linking this to buyer's contracting decision, the hypothesis is as follows:

Hypothesis 2. Budget announcement increases project allocation likelihood.

RFP preparation

We define RFP preparation as efforts undertaken by the buyer to describe his project. Before starting an auction, the buyer typically needs to invest some efforts to describe the project in an RFP. As IT projects can be idiosyncratic, customizable and codifiable to a high extent, the lack of preparation efforts can result in ambiguities with regard to project scope and contents. As a result, suppliers might submit ambiguous bids or propose their own approaches to the project. Such bids are likely to be more costly to evaluate. By contrast, a complete, clear and comprehensive project description is

likely to produce more structured bids that are less costly to evaluate. Therefore, we argue that better prepared RFPs bring down the cost of a unit of evaluation.

In addition, an RFP can contain requirements to vendor qualification or maximum price, similar to the announcement mechanism above. This reduces the cumulative costs of evaluation.

As decreasing evaluation costs make it more likely that the buyer decides to evaluate the bids, our hypothesis is as follows:

Hypothesis 3. More intensive RFP preparation will increase project allocation likelihood.

Negotiation

In the case of idiosyncratic IT projects with low codifiability, the buyer might need an input from the vendor (Barua et al., 1997; Lovelock, 1983) to make the project specification more complete (Banerjee & Duflo, 2000; Lovelock, 1983). Negotiation between the parties about the project may result in mutual adaptation – the buyer adapting his project description in accordance to the vendor's input and vendor adapting his bid to the updated project description.

A result of such communication may be foregoing the evaluation of other submitted bids and focusing on vendors with whom buyer has communicated, leading to a decrease of cumulative evaluation costs. The hypothesis is as follows:

Hypothesis 4. Negotiation with bidders will increase project allocation likelihood

Bid Filtering

As opposed to bid evaluation, bid filtering is a tactic of excluding bids from the consideration set. The buyer does not have to thoroughly assess bids to decide which one needs to be excluded. Similar to search, the buyer can focus just on one parameter, such as vendor's rating, proposed delivery time or price. By utilizing bid filtering for excluding bids from inefficient vendors from the consid-

eration set, the buyer is able to reduce his subsequent cumulative evaluation costs. Our hypothesis, therefore, is formulated in the following way:

Hypothesis 5. More bid filtering will increase project allocation likelihood.

The impact of buyer experience on the effectiveness of tactics

Apart from the tactics, another aspect of buyer behavior is experience. The broad reach of the Internet makes heterogeneity of auction participants very likely, in particular with regard to the level of their expertise (Bapna et al., 2004). Such heterogeneity potentially has an effect on auction outcomes, as the knowledge about product valuation and bidding process may differ across participants. Therefore, we incorporate the discussion of experience into our analysis.

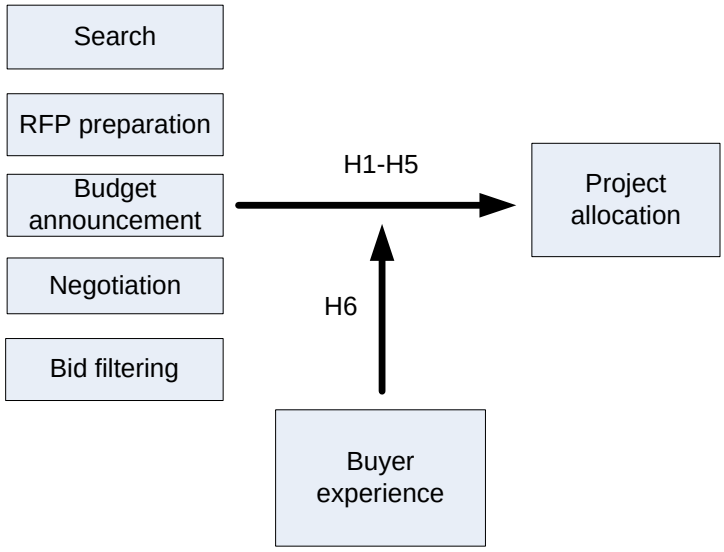

Figure 2. Conceptual framework. The impact of the buyer's evaluation costs-reducing tactics on project allocation, moderated by buyer's experience.

Buyer experience represents the outcome of learning from previous transactions at the online marketplace. This learning is likely to lead to the formation of efficient patterns or approaches to evaluation and familiarity with some vendors (e.g. the buyer might be able to early recognize inefficient

vendors whose bids can be ignored). In addition, an experienced buyer is likely to have higher technical and commercial expertise than his less experienced counterparts. It is quite straightforward to suggest that as buyer learns over the course of transactions, the effectiveness of the cost-reducing tactics should increase. With more experience, the buyer should be able to locate more appropriate vendors as a result of search; prepare more complete and professional RFPs; have a more precise estimation of the budget and estimate the price/quality trade-off; become more effective in negotiating with suppliers and filtering bids. Therefore, we hypothesize that the effect of tactics on evaluation costs and project allocation goes up as buyer experience increases.

Hypotheses 6. More buyer experience will increase the effectiveness of the five buyer's evaluation cost-reducing tactics.

The hypotheses are summarized in Figure 2. In the next section we discuss data and measures employed for empirical testing as well as results of the analysis.

4. Data and Analysis

4.1. Data

The data for the empirical analysis was collected from a leading online marketplace for professional services similar to the one discussed in Section 3.1. This site has been chosen for several reasons. First, it was one of the first entrants into this new industry in the late 1990s and by now has accumulated a large pool of buyers and vendors, which results in around 100 thousand RFPs posted yearly across all service categories. Second, IT services represent the most active and populated area of the marketplace. Third, the way exchange is organized at the marketplace is typical for the industry as described in Section 3.1, which allows for greater generalizability to the industry-level.

We focused on transactions from one subcategory – *Web Development,* which is the most populated and active at the marketplace. This category includes 13 sub-categories: Web Design & Develop-

ment, Other - Website Development, Web Programming, Online Forms & Database Integration, Ecommerce Website, Simple Website, Search Engine Optimization, HTML Email Design, Web Hosting, Internet Marketing, Flash MX, Usability & Interface Design, Flash Animation. We obtained data on auctions that started between March and September 2005 and finished not later than September, 14, 2005. The data collection was carried out with the help of a software tool, Kapow Robosuite, that allowed programming an intelligent agent to collect information about individual auction events, process exceptions in the data and store information in a format appropriate for analysis. The initial dataset contained 16,597 observations.

From this starting set, we excluded auctions that had missing data on project value. This left us with 13,165 auctions in the dataset. Next, we removed observations with extreme project values – below USD 100 (342 auctions) or above 20,000 (8 auctions). After that projects with very short project descriptions (below 5 words) were removed. Descriptions of this kind mostly refer to discussions between buyer and a vendor and before starting the auction (e.g. "As per our discussion"). There were 1,078 projects like this. We also removed *invite-only* auctions, as these are, in fact, negotiations where normally only one vendor is invited. Finally, after removing a number of exact duplicate auctions (which were an unexpected outcome of the data collection procedure), we were left with 9,863 auctions in the final dataset.

4.2. Measures

In this section we present the measures for independent, dependent and control variables.

Contract allocation

Contract award. Our dependent variable is whether or not the buyer awarded a contract as a result of an auction,, i.e. selected an auction winner. This was determined by the presence of a sign "Winner" next to the bid description in a finished auction. In some cases, more than one vendor can be

selected as winner in one auction (e.g. when the buyer wants to split the work between several vendors). When this is the case we still count this as one award.

Search for vendors

Invited suppliers. When a buyer searches for a potentially suitable vendor and finds one or more, those vendors are sent an electronic invitation to bid, which they may or may not accept. If one or more of the invited vendors accepts and places a bid, their presence is indicated on the web pages with a special "Invited"-tag. We model the number of invited vendors as a proxy that reflects the effort spent on search.

RFP preparation

The use of RFP preparation tactic is captured by two proxies – the length of project description and the presence of files attached to project description, reflecting the RFP format that is used at the marketplace.

Length of project description in RFP. We use the length of project description in words as a proxy for buyer efforts to specify her request. A similar measure, the length of statement of work in pages, has been used as an indication of project value and for IT project value and complexity before in (Mayer & Argyres, 2004). We model it as a continuous variable.

Attached files. A buyer can supply additional project details in files attached to the RFP. Manual 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 the project. We consider attached files as evidence of efforts invested in the project specification and model it as a dummy variable.

Budget announcement

Budget announcement. At the investigated marketplace, the only attribute the buyer can explicitly specify outside the RFP text as a benchmark is price. In particular, the buyer can specify the budget

within which he expects bids by choosing it from a scroll-down menu, e.g. "below 250", "between 250 and 500", "between 5,000 and 7,500", etc. The use of the budget announcement is modelled as a dummy variable, indicating the presence of a budget estimate.

Negotiation

Negotiation. During the auction, negotiation between buyers and vendors is enabled via a message board. As discussed in the Hypotheses section, negotiation may result in vendors updating their bids in response to new information. By manually examining nearly two hundred auctions we identified five phrases that are most widely used to refer to bilateral message board discussions in the bid text. These are phrases: "as per PMB", "as agreed", "thank you for your answer", "as per discussion", or "as discussed". The use of negotiation tactic is modelled through a dummy variable, based on whether one or more of bids in a given auction contain any of these phrases in the bid text field.

Bid Filtering

Declined bids. When reviewing submitted bids the buyer has an option to "decline" some of the bids, which means that they are removed from the list of bids. This measure is modelled as the total number of declined bids.

Experience

Finally, buyer experience is modeled via the number of previously awarded projects at the marketplace, since this indicates that the buyer has gone through the whole cycle of awarding and completing the project, which represents the best opportunity for learning.

Previously awarded projects. The page with auction details indicates the number of projects that the buyer allocated at the marketplace prior to the current auction. One potential inaccuracy in that measure is that a buyer who allocated four projects at four different auction events will have the same level of experience as a buyer who allocated four projects in a single auction and left other three auctions without awarding and thus would have somewhat less opportunity for learning from

the experience with the auction phase of the project compared to the buyer with four separate awarded auctions. However, the correlation of the number of awarded projects with the number of posted projects is very high, 0.923*** at $p<0.01$, which means that any potential bias should not be substantial.

Control variables

Project value. To estimate the project value we relied primarily on average bid, in line with one of the measures Snir and Hitt (2003) used. In case auctions had a "sealed" status, i.e. the value of the average bid was not disclosed, we used winner's bid as a proxy for project value[5]. When neither average bid nor winner bid was available, occasionally information on the actual price paid by the buyer for the accomplished project was available and used as the proxy for project value.

Auction duration. Time (in days) from start until end of the auction. In case the project is allocated to a vendor before the specified auction end, the end date is updated automatically.

4.3. Data analysis and results

Table 1 presents descriptive statistics for the key variables. The analysis of this table provides interesting insights. There is evidence that the marketplace is highly competitive, which can be seen from the average number of bids submitted in an auction (14.4; median is 11) as well as from the fact that the mean winning bid (USD 452) is 39% lower than the average bid (USD 740).

The mean project value of USD 740 is on the small side of typical projects in software development industry (which is understandable if we remember that the majority of buyers and sellers at the marketplace represent small business and freelancers[6]). It seems intuitively plausible that for a buyer of

[5] In fact, in the whole dataset there were just 16 sealed projects where details on winner's bid were available. Perhaps, this represents an irreguliarity in the marketplace design, as usually in sealed auction neither winner's bid nor other bids can be seen.

[6] An additional reason for the modest value of the projects can be that most bidders come from low-cost counties such as India, China or Russia. The hourly cost of IT workforce may be as low as USD 5-15/ hour – several times lower than in developed

such a project, committing time (and other resources, if applicable) to evaluate in-depth around 14 bids (in an average project) as well as the quality and experience of the vendors behind these bids might be uneconomical. It is not surprising, therefore, that only slightly less than half of auctions in our dataset (48%) end up with buyer allocating the project to a vendor.

Budget announcement is by far the most popular of the hypothesized cost-reducing tactics – it is used in 50% auctions compared to search (33%), bid filtering (25%), attached files (17%) and negotiation (12%). Average length of project description in an RFP is around 140 words. Around 17% of RFPs contain attached files with additional information about the request.

Table 1. Descriptive statistics for the dataset of 9,863 reverse auctions.

	Mean	Std. deviation	Median
Number of bids	14.4	11.9	11
Project value, USD	740	1,193	401
Auction length, hours	150	253	95
Average rating (scale 0-5)	4.59	0.66	4.7
Contract awarded	0.48	0.50	0
Winning bid, USD	452	803	225
Invited suppliers (1 if utilized)	0.33	0.47	0
Invited suppliers	1.8	4.1	0
Length of project description, words	139	116	105
Attached files	0.17	0.38	0
Budget announcement	0.5	0.5	1
Declined bids (1 if utilized)	0.25	0.43	0
Declined bids, number	1.5	4.6	0
Negotiation	0.12	0.37	0
Previously posted projects	15.4	27.5	6
Previously awarded projects	9.2	18.3	3

countries. Therefore, the cost of similar projects executed between customers and vendors in developed countries can be several times higher than the price at the online marketplace.

When looking at the median statistics of previously posted (6) and awarded projects (3) we can see that the majority of buyers at the marketplace have posted and carried out multiple projects, giving them opportunity to build up experience and potentially learn how to use the tactics effectively. Appendix 1 shows the cross-correlations between the variables in the models, which exhibit no signs of potential multicollinearity problems.

We test our hypotheses with a logit regression model, similar to the one used by Snir et al., 2003[7], and following their analytical results, we omit the number of bids and average rating from the regression as these are dependent on project value, which is accounted for. Thus, our base model with all the measures and proxies for buyer tactics has the following form:

$$\Pr(A_i) = \beta_0 + \beta_1 \ln(project\_value) + \beta_2 \ln(project\_duration) + \beta_3 \ln(invited\_suppliers) + \beta_4 \ln(description\_length) +$$

$$+ \beta_5 Attached + \beta_6 Budget\_announcement + \beta_7 Communication + \beta_8 \ln(Declined\_bids) + \varepsilon_i \qquad (1)$$

In the regression model we used natural logs of the continuous variables to ensure a normalized distribution. The second model adds the interaction effects of the tactics with experience to model (1). The results of both regression analyses are presented in Table 2, with the Nagelkerke R^2 of both models suggesting that a reasonable amount of variation is explained by the base model, as well as the addition of the interaction effects with experience. The two control variables, project value and auction duration, both have a negative, significant effect on project allocation (-0.246 and -0.624, both at $p<.01$), in accordance with previous results (Snir & Hitt, 2003).

The coefficient for ln(invited suppliers) is positive and weakly significant ($\beta=0.052$ at $p<0.1$) in the base model, and although the positive direction remains when the interaction effects are added, the effect becomes insignificant in model (2), leading us to conclude that positive impact of search for vendors on project allocation (Hypothesis 1) is marginal at best.

[7] In order to additionally validate our dataset and results, we have replicated the analysis in Table 4 of Snir and Hitt (2003) and found similar results. The details are available from the authors upon request.

Table 2. The effect of buyer tactics on the increase of award probability: logit regressions and the marginal effect of changes in independent variables.

Variable			Δ Independent variable	Δ Award probability
	(1)	(2)	(3)	(4)
Constant	4.168*** (0.206)	3.295*** (0.257)		
ln(project value)	-0.301*** (0.026)	-0.246*** (0.026)		
ln(auction duration)	-0.647*** (0.023)	-0.624*** (0.023)		
ln(invited suppliers)	0.052* (0.027)	0.044 (0.038)	(M - St Dev.) to M	1.1%
			M to (M + St Dev.)	1.1%
ln(description length)	0.016 (0.028)	0.018 (0.041)	(M - St. Dev.) to M	1.8%
			M to (M + St Dev.)	1.8%
Attached files	0.424*** (0.059)	0.492*** (0.087)	0 to 1	10.5%
Budget announcement	0.087* (0.046)	0.069 (0.067)	0 to 1	2.1%
Negotiation	0.875*** (0.065)	0.898*** (0.092)	0 to 1	21.4%
ln(declined)	0.436*** (0.031)	0.484*** (0.042)	(M - St. Dev.) to M	7.7%
			M to (M + St Dev.)	8.0%
ln(awarded projects)		0.293*** (0.108)		
ln(invited suppliers) X ln(awarded projects)		0.037 (0.024)		
ln(description length) X ln(awarded projects)		-0.002 (0.023)		
Attached files X		-0.082* (0.048)	(M - St. Dev.) to M	6.6%
ln(awarded projects)			M to (M + St Dev.)	6.6%
Budget announcement X		0.085** (0.036)	(M - St. Dev.) to M	11.5%
ln(awarded projects)			M to (M + St Dev.)	11.9%
Negotation X ln(awarded projects)		-0.026 (0.054)		
ln(declined) X ln(awarded projects)		-0.023 (0.028)		
N	9,863	9,863		
-2Log L	11,848	11,531		
Nagelkerke R^2	0.224	0.259		

Notes: Dependent variable – probability of a project allocation. Standard errors are in parentheses. The changes in the independent variables provided in columns "**Δ Independent variable**" and "**Δ award probability**" are based on the coefficients of the full model, i.e. model (2), including those for the insignificant direct effects for illustrative purposes. *p<0.1, ** p<0.05; *** p<0.01

To further assess the practical effect of the independent variables on project allocation, we evaluate the effect of the marginal increase in each variable on the award probability, reported in columns (3) and (4). As pointed out in Hoetker (2007), a common approach for estimation of such effect is to calculate the effect for a number of sets of "theoretically interesting and empirically relevant values of the variables" (Hoetker, 2007: 335). For continuous variables one of the widely used approaches is to fix their values at the levels of one standard deviation below and above the mean. Therefore, we calculate the effect of the increase of ln(invited suppliers) from the mean minus one standard deviation (M – St. Dev.) to the mean and from the to the mean plus one standard deviation (M + St. Dev.). To carry out this estimation, all dummy variables in the model were fixed to zero, while all other continuous variables were set to their means[8]. The increase in ln(invited suppliers) by one standard deviation as per model 2, Table 2 results in an 1.1% increase of award probability in each of the two intervals (Table 2, columns 3 and 4). In terms of the number of vendors, this would be equivalent to inviting an additional 0.64, 1.47 and 3.39 vendors to the auction respectively. Although obviously in real world auctions only an integer number of bidders can be invited, these figures are helpful in illustrating the practical implications of the results.

Hypothesis 2 (request for proposal preparation) finds partial support by the data in column 2 of Table 2. The coefficient for the dummy Attached files is significant and has the expected sign, indicating a positive effect on project allocation. Attaching a file to RFP description results in an increase of award probability by 10.5% (Table 2, columns 3 and 4). However, the coefficient for description length is not significant. In a followup investigation, we observed that a substantial part of project descriptions on the lower end of the range, although longer than our initial conservative cutoff of 5 words, still do not provide any detailed description per se; instead, they may contain a link to a website the buyer wishes to clone or a reference to a software product or a discussion between the buyer

[8] The same approach was used in all other subsequent assessments of the effects of (marginal) parameter changes on the award probability in the paper.

and the vendor. To further investigate this, we re-ran the model on a sub-sample with an increased RFP description cut-off length of 10 words instead of 5. The coefficient for description length is positive and significant (β=0.052 at $p<0.001$), without substantially changing the other coefficients. Although admittedly a slightly ad hoc test, it does provide support to the hypothesis that investing efforts into RFP preparation increases project allocation likelihood by decreasing evaluation costs. The marginal effect of the increase of ln(description length) from one St. Dev. below mean to mean is 0.018, as is the effect from mean to one St. Dev., which means an 1.8% decrease/increase in award probability. In terms of the number of words, this is equivalent to extending the description from approximately 44 words to 101 to 234 words.

Hypothesis 3 (budget announcement) also finds marginal support from the test results: budget announcement has a weak influence on the auction outcome as a main effect (β=0.087 at $p<0.1$), but this becomes insignificant once the interaction effects are added. The effect of budget announcement on award probability showed that a buyer who specifies his budget level would be 2.1% more likely to award the project than the buyer who does not).

Hypotheses 4 and 5 on bid filtering and negotiation both find strong support by the results of the regression analysis (β=0.484 and β=0.898, both $p<0.001$). Buyers utilizing bid filtering and negotiating with the vendors during the auction are more likely to award projects than those who do not. The effect of using negotiation corresponds to a 21.4% increase in project allocation probability. Since bid filtering is operationalized by a continuous variable, we measure its effect from the mean minus one standard deviation to the mean as well as from the mean to the mean plus one standard deviation. In terms of the number of declined bids, this is equivalent to an increase from 0.64 to 1.35 to 2.83, which increases award probability by 7.7% and 8% respectively.

Finally, we test Hypothesis 6 (the effect of buyer experience on the effectiveness of cost-reducing tactics). As model (2) shows, experience moderates the effectiveness of two of the five tactics. The

effect for budget announcement is positive (β=0.085 at p<0.05) but the effect for RFP preparation (more precisely – for Attached files) is negative (-0.082 at p<0.1), which is contrary to expectations.

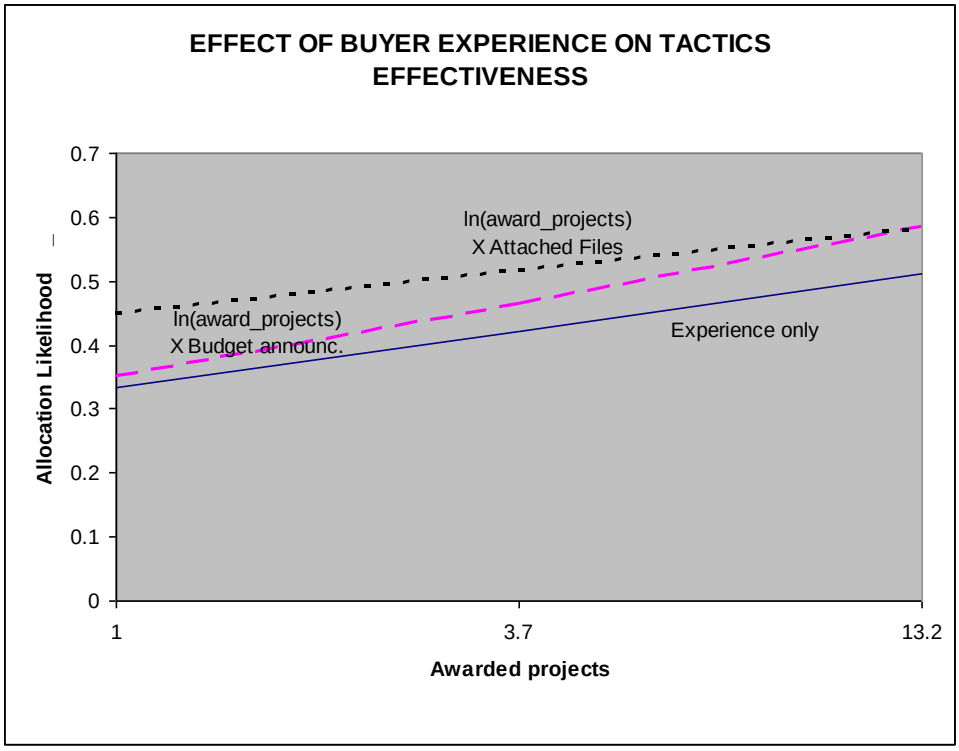

Figure 3. The effect of the interaction between buyer experience and individual tactics on project award likelihood. "Experience only" means that dummy variables are set to 0, while other variables are set to their means.

We again calculate the effects of the marginal increase of experience on the probability of award at several theoretically meaningful sets of values (Hoetker, 2007; Jaccard, 2001). Using RFP preparation with increased experience results in decreasing effectiveness, as the positive effect of RFP preparation on award likelihood goes down from 10.5% to approximately 6.6% as ln(awarded) goes up from the mean minus one St. Dev. to mean and from the mean to the mean plus one St. Dev. By contrast, as experience increases, the positive effect of budget announcement grows from 2.1% to an 11.5% increase in award likelihood at the first St. Dev. of ln(awarded projects) increase and

11.9% at the second St. Dev. of increase. These results are illustrated graphically at Fig 3[9]. We conclude that buyer experience increases the effectiveness of budget announcement, while at the same time it decreases the effectiveness of RFP preparation, although the combined effect remains positive, as experience by itself has a strong positive main effect on project allocation. The experience that buyers accumulate thus translates into a better judgment of the expected project costs, reducing the need to extensively evaluate bids outside this cost range, and leading to increased project allocation.

5. Discussion and limitations

5.1. Discussion of the findings

In the present study we extended the body of knowledge on an important factor in online transactions – the costs buyers incur to evaluate purchasing alternatives, which encompasses the evaluation of vendors (e.g. vendor quality) and their offerings (bids). We treated evaluation costs as an endogenous factor of buyer behavior and discussed several tactics that are likely to affect buyer's project allocation decision via the reduction of associated evaluation costs.

The empirical testing with the transaction data from a leading marketplace for IT services produced substantial evidence in support of the hypothesized effects. The hypotheses on the positive impact of search, budget announcement, negotiation and bid filtering were unambiguously supported. The support for the positive effect of RFP preparation on project allocation likelihood is more nuanced – while the presence of attached files is positively associated with allocation likelihood, the description length becomes positive and significant only for description lengths above a minimal threshold of 10 words. The findings on the effect of buyer experience on the effectiveness of buyer tactics

[9] In case of ,ln(awarded projects), mean – 1 St.Dev, mean and mean + 1 St. Dev. are are equivalent to awarding 0.04, 3.56 and 7.01 projects.

have confirmed only part of our expectations. In addition to a positive main effect, experience increases the effectiveness of Budget announcement, but reduced the effect of attaching files to the RFP. A possible explanation for this unexpected result might be that with experience, relationships develop with a subset of suppliers, which could lessen the need for extensive a priori project documentation for those suppliers. Given the somewhat more complicated effects of experience, an alternative option for examining the relationship between buyer experience and the tactics would be to assess the effect of buyer experience on the *use* of tactics, rather than on their *effectiveness* with regard to increasing allocation likelihood. However, we found that the use of tactics does not vary substantially between experienced and inexperienced buyers[10].

However, there are a few potential alternative explanations for our results that need to be ruled out. We operationalized search through the presence of invited suppliers. However, an invitation to bid can be a result of buyer's previous experience with the vendor, i.e. more out of habit than specific search. In order to rule out this option, we tested our model on a subset of projects where none of bidders had previously won a project from the buyer who posted that project. The regression coefficient for ln(invited suppliers) was again positive and significant (β=0.056 at $p<0.05$; full details of the regression are available from the authors), thus providing evidence that the observed positive effect for search does not result from the existence of prior ties between buyer and supplier (the winner), but rather from an active a priori search for fitting suppliers.

Also, we need to ensure that the observed effects are indeed the result of decreasing buyers' evaluation costs, rather than some other consequences of the tactics use, because as noted in the introduction, most of the tactics also serve additional purposes. At this point it is useful to make a distinction between ex-ante buyer tactics, such as search, RFP preparation and budget announcement that are

[10] For instance, buyers with less than 1, less than 5 and more than 5 awarded projects have, respectively, the following means of tactics use: 0.16, 0.17 and 0.19 for attached files; 4.65, 4.64 and 4.57 for ln(description length) ; 0.11, 0.12 and 0.14 for negotiations; 0.53, 0.53 and 0.48 for budget announcement; 0.32, 0.33 and 0.32 for search; 0.26, 0.26 and 0.22 for declined bids.

used prior to project posting and ex-post tactics, such as negotiations and bid filtering that are employed after the auction is started (see also Fig.1). If, as we claim, one of the goals of the tactics is to reduce the evaluation costs, we should expect to see a negative effect of most ex ante tactics on the number of bids submitted by suppliers (the exception being search, since inviting a supplier to bid in the auction will increase the likelihood that that supplier will bid and hence increase the number of bids, ceteris paribus). At the same time, the number of submitted bids during the auction should influence the use of the ex post tactics, as the buyer will be inclined to reduce the evaluation costs when many bids are received. If we look at the correlation table in the Appendix, we find a small negative correlation between the number of bids and project description length, whereas attached files and budget announcement are uncorrelated with the number of bids, thus providing partial support for our interpretation. With regards to the employment of ex-post tactics, the correlation table in Appendix 1 shows, the use of Negotiation and Declined bids is positively correlated with the number of submitted bids. Together these results provide some, although not entirely conclusive, evidence for our interpretation of the tactics having a component aimed at reducing evaluation costs.

5.2. Limitations

Several issues need to be addressed that concern the assumptions underlying the theoretical discussion; the use of measurement proxies; and alternative explanations.

In line with previous literature on evaluation costs (Barua et al., (1997) and Snir and Hitt (2003)), the hypotheses of this study rely on an assumption that the use of cost-reducing tactics has negligible costs compared to the costs of bid evaluation. As our empirical investigation did not produce any evidence that extensively describing RFPs and negotiating with vendors results in a lower project allocation likelihood, which would signal increased total costs, this assumption seems plausible.

Another issue refers to empirical validation of the theoretical model and its underlying logic. We were able to empirically test the predictions about the consequences of buyer tactics for project allocation resulting from evaluation costs reduction, rather than measure the evaluation costs per se. This is, however, a common way of theory validation in economics due to the fact that actually measuring attributes such as evaluation costs is very challenging outside laboratory settings. As Lucking-Reiley puts it: "Field tests assess the practical predictive power of a theory, since most theoretical assumptions in economic models are intrinsically unobservable in practice" Lucking-Reiley (1999: 1075).

The inability to directly test the effect on evaluation costs leaves us with a necessity to tackle alternative explanations for the obtained results. One alternative explanation has to do with buyer opportunism. The incentive behind buyer opportunism in such environment can be that instead of attempting to allocate their projects with an efficient vendor at an auction, buyers can instead try to obtain price information and/or get free professional advice from vendors on the best way to develop her project. After obtaining such information, the buyer can resort to off-market vendors and use it as a leverage to obtain favourable conditions for the off-market deal. One could suggest that investing efforts into the sourcing process by applying the identified tactics can be a sign of buyer's commitment to transact at the marketplace, while an opportunistic buyer would try to avoid additional efforts and costs if he treats an auction just as an information gathering exercise.

To address this alternative explanation, we tested our hypotheses on a sub-sample of first-time buyers, where one might expect the level of opportunism to be the highest, as these buyers do not yet have a reputation to sacrifice. One could expect that in the sub-sample of first-time buyers the effect of the tactics would be higher as new buyers are trying to signal their commitment to suppliers. A test, however, showed that the magnitudes of the coefficients for first-time buyers are not signifi-

cantly different from the full dataset[11]. This is an indication that different levels of buyer opportunism are not a critical differentiator for the use of the tactics.

Another issue worth discussing is the metrics used to account for the use of some of the tactics. For instance, the measurements used to capture negotiation and search might not fully account for the relevant buyer efforts to negotiate and search at the online marketplace. Indeed, we only trace the presence of invited vendors at an auction and references towards message board discussions in bids instead of directly measuring relevant efforts (e.g. time spent on searching in the vendor database and number of messages exchanged between parties). However, this only implies a stricter test of the underlying theoretical effects, and the actual impact of the tactics can expected to be stronger, rather than weaker. To provide a more comprehensive account for the use of additional buyer tactics, subsequent research might use questionnaires to directly survey the buyers about the tactics they employed.

Finally, our findings were obtained at a marketplace that consists mostly of small and medium companies as well as freelancers. It is not certain, to what extent these findings can be generalized to different procurement settings and buyer categories. For example, one can expect that the sourcing behavior of larger companies would be more sophisticated than that of small companies. Also, further testing it required to find out whether these findings would be applicable across other categories of professional services, such as creative writing or marketing consulting.

6. Conclusions and further research

The evaluation costs buyers incur when assessing purchasing alternatives at online markets, especially for complex and idiosyncratic products and services, are a key factor for the outcomes and efficiency of transactions (Snir et al., 2003). This study contributes to the electronic markets literature by providing empirical support to theoretical reasoning on costly bid evaluation by testing direct impli-

[11] The detailed results are available from the authors upon request.

cations of existing models. This is important because the "record of direct application" of many key models is typically weak (Barua et al., 1997). By confirming some of the direct insights of the models on evaluation costs this paper helps to further connect analytical models from auction theory and electronic markets theory with business practice.

We extended and tested the theory on the effects of evaluation costs on the outcomes of transactions in online environment. While previous studies mostly focused on theoretical models of buyer behavior in which evaluation costs were completely or partially exogenous, in the present study we extend the theory by treating evaluation costs as an endogenous factor. We identify several tactics that help buyers reduce their evaluation costs at online markets for IT services, elaborate on the hypothesized effects of these tactics on project allocation and carry out empirical tests on real transaction data. Our findings can be grouped around two themes.

First, we identified five distinct tactics that buyers can use to manipulate the level of costs incurred when evaluating vendors and vendor bids in online auctions for IT services, namely search (for vendor), RFP preparation, budget announcement, negotiation and bid filtering. Extensive empirical testing confirmed our hypotheses that the use of these tactics leads to a higher likelihood of project allocation, which implies a reduction of underlying bid evaluation costs. The results are somewhat more nuanced for the effect of RFP description length, which is one of the proxies for RFP preparation. The length of RFP description becomes an effective means for increasing project allocation likelihood only above certain length threshold (10 words, in our case).

Second, we studied how the effectiveness of cost-reducing tactics changes as buyers gain experience in transactions at the online marketplace. We found that buyer experience significantly interacts with two tactics – Budget announcement and RFP preparation. Interestingly, while buyer experience increases the effectiveness of budget announcement leading to a sharper increase of allocation likelihood, at the same time it decreases the effectiveness of RFP preparation.

There are several ways to extend and capitalize on the present research. This should be done by separately or jointly applying a number of approaches and methods, such as analytical modeling, laboratory experiments and field research. First, further testing of the hypothesized relationships and, especially, of the underlying evaluation cost reduction mechanisms should be carried out. This can be done in a laboratory setting that provides a proper environment to measure actors' hidden attributes, such as the level of evaluation costs and also enables to extend the generalizability by ensuring control over interfering factors. Second, analytical modeling using auction theory can be applied to model buyer equilibrium behavior with regard to the use of evaluation cost-reducing tactics. A third avenue to extend the research should be conducting further field studies to test our findings on different online marketplaces and with other services areas. This will help to account for the differences in the marketplace design and control for the effect of service complexity on the role of evaluation costs.

The results of the study have substantial practical implications for all stakeholders at online marketplaces. For buyers of complex and idiosyncratic IT services the discussion of the five tactics provides a guide to a more efficient purchasing behavior. By applying the discussed tactics buyers gain more control over the level of the evaluation costs involved in the selection process and increase the chances to select an efficient vendor. Increased buyer ability to cope with evaluation costs and take contracting decisions is beneficial for vendors, too. As the evaluation costs decrease, there is less chance for "perfectly acceptable bids" to be ignored just because of the high expected level of evaluation costs. This leads to smaller overall efficiency loss in the sourcing process. The market makers also benefit from buyer's ability to decrease evaluation costs as market makers earn more commission from realized projects. Therefore, market-makers should encourage the growth of buyer awareness of the cost-reducing tactics, e.g. by promoting "best practices" for sourcing among buyers, making available case studies and making the use of tactics more intuitive especially for buyers who

lack experience. Besides, market makers should try to retain repeat buyers, as such buyers accumulate experience in online transactions, thereby increasing their own evaluation efficiency and contributing to the overall efficiency of the marketplace. To conclude, the information on the behavior of market participants in online reverse auctions not only leads to more refined theory, it also "can be used to design better future auctions, and in and of itself may have commercial value" (Pinker et al., 2003:1461).

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Appendix 1. Pearson's two-tailed correlations

	Number of bids	Project Value	Auction Duration	Average Rating	Award	Invited sup-pliers	Project De-scription	Attached Files	Budget	Declined	Negotia-tion	Awarded projects
Number of bids	1.000											
Project Value	0.135***	1.000										
Auction duration	0.119***	0.095***	1.000									
Average rating	0.122***	-0.032***	-0.024**	1.000								
Award	-0.001	-0.144***	-0.144***	0.103***	1.000							
Invited suppliers	0.051***	0.077***	0.035***	0.016	0.014	1.000						
Project description	-0.061***	0.099***	0.040***	-0.021**	-0.017*	0.113***	1.000					
Attached files	-0.004	0.044***	-0.005	0.021	0.072***	0.073***	.076***	1.000				
Budget	0.010	-0.136***	-0.076***	0.017*	0.099***	0.004	-.033***	0.015	1.000			
Declined	0.32***	0.061***	0.064***	-0.016	0.079***	0.077***	.054***	0.049***	-0.001	1.000		
Negotiation	0.108***	0.000	0.011	0.047***	0.137***	0.040***	.014	0.022**	0.013	0.000	1.000	
Awarded projects	-0.097***	-0.072***	-0.007	0.016	0.107***	-0.059***	-.047***	0.000	-0.054***	-0.050***	0.014	1.000

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

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