ULAD RADKEVITCH

Online Reverse Auctions for Procurement of Services

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Online omgekeerde veilingen voor het inkopen van services

Thesis

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To my parents

Preface

Curiosity gave the initial momentum to this research. During the winter of 2002-2003, together with some colleagues we were sitting in an office of an IT company, desperately trying to win outsourcing contracts on online marketplaces. Hélas, most our efforts were futile. Not only the clients were not rushing to accept our bids, but the bids of our competitors from India or Russia were equally ignored in most auctions. And occasional buyers who did pick a winner seemed to change their strategy unpredictably over time – sometimes awarding projects to their incumbent suppliers and sometimes putting projects up for an open bidding.

This first encounter with online reverse auctions raised a number of mind-boggling questions. For instance, why would buyers often ignore good bidders and leave auctions without choosing a winner? What is the buying strategy of repeat buyers in the long run? How do relationships between the buyer and supplier develop after the auction when the service is being delivered?

Although auctions have been around for hundreds of years, they still pose many exiting questions that practitioners and researchers strive to answer. The advent of the Internet has increased many-fold the scope and diversity of auctions, but so did the amount of questions that need answers. In this thesis I take a step towards uncovering some of the issues surrounding reverse auctions that firms and individuals use to procure services, such as IT or construction services.

Understanding how auctions work and how they produce outcomes requires understanding of the behaviour of bidders and buyers alike. In reality, auction participants do much more than just biding and accepting bids – they make preparations for auctions; interact with each other during the auction run and work together to deliver the services after the auction ends. This has implications for auction outcomes; this is why these and other aspects of buyer and supplier behaviour are addressed here.

Now after over four years of academic research I am back in the IT business, and part of the job consists in bidding, in any given month, for five to ten outsourcing contracts for customers around the world. In tenders I constantly find myself fretting over the winner's curse, trying to reduce (or enhance, if it is to our advantage) the information asymmetry between us and the buyer over certain contract features and guessing the types and bidding strategies of competitors. And, as a straightforward takeaway of this thesis, I'm trying to identify buyer's type early into the tender (to understand how much efforts to invest in bidding), working to help prospective customers reduce bid evaluation costs and struggling to mitigate the impact of auction outcomes on the way we deliver services at the contract execution stage.

It feels good to be able to apply the results of this investigation to practice. Hopefully, the readers of this thesis can find them useful, too.

Acknowledgements

First of all, I would like to express gratitude to my parents for their endless support as well as for wanting this PhD, at times, even more then I did.

Many thanks to Prof. Eric van Heck for luring me into the PhD programme back in 2002 and for teaching me to look for a win-win solution in any situation. Through the recent years I have been really blessed with a great duo of supervisors – one is Eric himself and the other is Dr. Otto Koppius, Eric's former PhD student. Eric is a master of strategy, who can always see the forest through the trees. Otto, by contrast, is more of a master of detail, with a profound knowledge of academic literature as any student or colleague, who has ever left Otto's office with a long list of papers to read, would confirm. Together, Eric and Otto will help many decent dissertations materialize in the years to come.

Empirical research feeds on data and I would like to acknowledge great support of people and companies without whom this research would not be realized. These are Ian Ippolito, CEO of Exhedra and the founder of RentACoder; Jan Siderius, the founder of Negometrix and Evert Jan Hubar from the same company; John Hand, formerly the head of facility management of GGD Amsterdam and Wouter de Groot from the same organization; Kenny Macdonald, Ron Halkes, and Frans Nijwening from Valtos Architecten & Adviseurs; Wolter Hubar from W+R Installatie-adviseurs, Ruud Plu from Significant, Rikkert Engels from Kapow Technologies as well as directors and project managers of two Dutch construction companies whose names cannot be disclosed for confidentiality reasons.

The PhD life would be impossible without friends from all over the world who worked (or are still working) at Erasmus University at different time - Hong Chen (who tolerated me for four years as his office mate), Chintan Amrit, Ksenia Iastrebova, Wolf Ketter, Ting Li, Gosha Nalbantov, Olga Novikova, Willem Smit and Fang Zhong.

In fact, dozens of people have helped the progress of this thesis at different stages and in different ways, including academics who gave advice, friends who visited me as well as colleagues and employees of Erasmus University Rotterdam School of Management who provided support. Sorry for not mentioning you all by name here!

Finally, a word of thanks goes to people at ScienceSoft, a Minsk-based IT company, for making me believe I'm needed back home, in Belarus.

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Chapter 1. Introduction

The concept of reverse auctions was right in the GE sweet spot and we wasted no time in spreading the new technology across our businesses. We now run global auctions daily — $6 billion worth last year, $12 billion this year, generating over $600 million in savings for the company in 2001.[1]

…they [reverse auctions] damage supplier relationships and degrade the stature of the supply management profession by compelling buyers to remain strongly focused on unit prices, versus total cost.... Therefore, the use of reverse auctions should be explicitly discouraged by ISM[2] *and similar organisations.*[3]

1.1. Motivation

This thesis is about online reverse auctions for services, in which buyers seek to select a supplier and suppliers compete for service contracts by submitting their bids online. Nowadays as businesses are experimenting extensively with the use of online reverse auctions, particularly in the service industries, the stage is set for many practically and theoretically motivated problems to be investigated in this respect. In this thesis we focus on a set of problems related to the use of auctions, award of contracts, buying patterns and the effect of auctions on service project outcomes in two contexts – online markets for IT services, and in the building construction industry. The specific contributions of this thesis consist in 1) explaining how a buyer's exchange history affects their allocation mechanism choice on the online market for IT services; 2) determining the effect of tactics that allow buyers to increase the likelihood of con-

[1]From the farewell address of Jack Welch at the shareholders meeting in April 2001. www.callcentres.com.au/GE4_Jack_Welch.htm

[2] Institute for supply management.

[3]From an interview of Bob Emiliani, Professor at Central Connecticut State University, to Enterpreneur.com, July 7, 2006. www.entrepreneur.com/tradejournals/article/149460706.html

tract award on online marketplaces for IT services; 3) identifying the repeat buying patterns in the online markets for IT services and the theoretical properties of such patterns; and 4) explaining how the outcomes of reverse auctions in the building construction industry affect the winning contractors and project outcomes.

Online reverse auctions revolutionized corporate procurement in the beginning of the 21st century. Shortly after they were pioneered by General Electric, companies in great numbers rushed to adopt reverse auctions to optimize the way they buy products and services. Some internet start-ups, such as Freemarkets and Elance Online, successfully used them to come up with brand-new online business models. At the core of the initial popularity of reverse auctions was the belief that by placing part of the procurement process online and bringing transparency into the market prices, companies were able to optimize their procurement and achieve significant price reductions. Indeed, in many reported cases, companies were able to cut their contract prices by as much as 30% (Beall et al., 2003). This created much excitement in the business media and academic press. Headlines such as "IT Auction Site is Ace for Buyers" were common (Motorola, 1999).

However, the adoption of reverse auction soon stumbled into fierce opposition from suppliers from a number of industries, industrial associations and even some buyers. The concerns were that by creating extreme price transparency and stimulating competition, reverse auctions allowed buyers to squeeze their suppliers, to priority to low cost at the expense of quality, to destroy the value of long-term buyer-supplier relationships, and, on the suppliers' end, to encourage behaviour such as low-balling in bidding and "cutting corners" during contract execution. The newspaper and journal headlines changed to the likes of "Potential Pitfalls of E-Auctions" (Kwak, 2002) and "Reverse Auctions Destroy Relationships" (Altman, 2003).

What happened is that as a business innovation, reverse auctions simply matured from one stage of the lifecycle to the next. In the early stages of their life, new technologies and business innovations provoke feelings ranging from excitement to disappointment before they eventually find a stable niche in business practice. Gartner's widely-cited Hype Cycle (Gartner, 2007) outlines several phases of emerging technology that carry self-explanatory labels such as "Peak of Inflated Expectations", "Trough of Disillusionment" and "Slope of Enlightenment" and reflect what business thinks of the new technology and how media cover it at different points of time. More often than not, the initial enthusiasm about the promises of a technology is eventually overshadowed by disappointment when limitations and drawbacks surface; as experimentation and learning go on, however, organisations come up with ways to extract business value from the technology and it becomes a mainstream element.

Today, there is "a calmed enthusiasm and wiser (more realistic) approach towards the design and use of auctions" (Elmaghraby, 2007: 410). A recent survey conducted by Supply Management.com found that as much as 40% of buyers use online reverse auctions (SupplyManagement.com, 2007). Reverse auctions are used to procure a wide range of products and services, from several hundred euros' worth web design

tasks to a billion euro automotive parts contracts. Reverse auctions seem to have reached the "Slope of Enlightenment" phase of Gartner's Hype Cycle, in which the press loses interest in the technology, although businesses continue experimenting with it.

One area where the application of reverse auctions is undergoing a considerable amount of exploration and experimentation is the procurement of services. Although long before the internet age auctions were used in areas such as tendering for construction projects, now they are increasingly employed for procuring a variety of services, from legal advice to software development and tax consulting (Arbin & Hultman, 2003; Zhong, 2007). "The enterprising adoption of auctions for the procurement of services, such as marketing, insurance, legal, information technology, as well as products and goods that possess a strong qualitative dimension, such as food additives and promotional items" is a key characteristic of today's landscape of online reverse auctions (Elmaghraby, 2007: 410).

We identify three interrelated problem areas that necessitate research into the procurement of services via reverse auctions. These are auction context, service characteristics, and buyer-supplier relationships.

Reverse auctions for services are to a large extent influenced by the ***context*** in which they take place (Elmaghraby, 2007). Being a part of the procurement process (Figure 1-1), auctions are inevitably affected by factors related to events that occur before bidding or even during bidding (exchange initiation, exchange preparation and auction/negotiation stages). One such factor is the past experience of auction actors (Rothkopf & Harstad, 1994). Past projects between the buyer and supplier in settings such as building construction can affect the amount of information available to a particular supplier with regard to important aspects of a forthcoming construction project (e.g. the likelihood of design changes), and therefore affect the bidding behaviour (Rothkopf & Harstad, 1994). Similarly, in custom software development previous projects between buyer and vendors greatly affect the outcome of bidding for further projects, as the incumbent vendor is able to learn from past projects and reduce his production costs (Whang, 1995). Another example of contextual factors affecting reverse auctions is the high information intensity of procurement in settings such as the building construction or software development services. Exchanging large amounts of information regarding project specification and bids makes procurement expensive (Goldberg, 1977) and can even force buyers to abandon auctions without awarding a contract when costs become too high (Snir & Hitt, 2003).

Adoption of auctions for the procurement of services is not trivial since the ***service characteristics*** are quite different from those of physical products. Services are characterised by intangibility, heterogeneity, simultaneity and perishability (Axelsson & Wynstra, 2002) This means that services are not material (and cannot be easily broken down into their elements), have diverse and customized properties, are consumed at the same time as they are produced and cannot be stored. Many of the services belong to the categories of credence or experience goods, which makes ex-ante specifi-

cation and assessment of service quality difficult. Also, in many situations a competent service provider may be required to identify the problem and propose a solution even before the contract is signed. Services of this type (e.g. management consulting or website development) have diagnosis and implementation phases (Lovelock, 1983).

Yet another issue related to the discussion of service characteristics and auction context is ***buyer-supplier relationships***. The procurement of services (but not all products) requires buyers and suppliers to interact for a period of time while a service is being delivered. This is often the case, for instance, in the development of customized enterprise information systems, or in management consulting projects. Such interaction is likely to allow buyer-supplier relationships to exhibit themselves beyond the themes usually discussed in the literature on reverse auctions for goods, which include issues such as the effect of auction design and other parameters (e.g. number of bidders) on the suppliers suspicion of a buyer's opportunism and willingness to make idiosyncratic investments (Jap, 2003; Jap, 2007). Therefore, the issue of buyer-supplier relationships is especially important in the procurement of services.

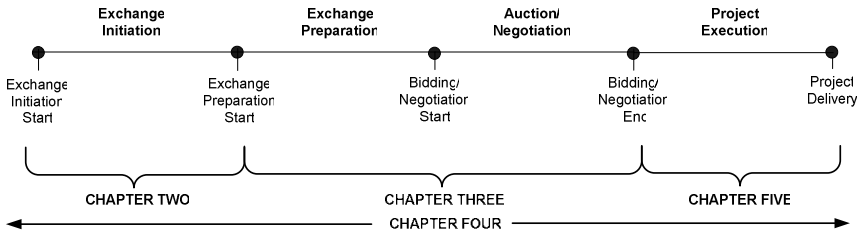


Figure 1-1. The Procurement process using online reverse auctions: thesis structure

It is only recently that systematic research into these three problem areas, supported by some solid empirical evidence, has started to emerge, e.g. Snir and Hitt (2003), Jap (2003), Jap (2007), Gattiker et al (2007). However, although some questions have been addressed by these studies, many new ones emerge. There are calls for more research efforts to understand, for example, the context in which reverse auctions take place (Elmaghraby, 2007; Rothkopf & Harstad, 1994), the longitudinal effects of reverse auctions (Jap, 2007), factors underlying actors' behaviour (Engelbrecht-Wiggans, 2000; Rothkopf & Harstad, 1994), and the impact of auctions on buyer-supplier relationships (James, 2003).

In this dissertation we explore reverse auctions in two industries – IT services and construction – and translate the discussion of the three problem areas (service characteristics, auction context and buyer-supplier relationships) into concrete, context-specific, theory-driven research questions. We address these themes in four empirical

studies, each of which has a distinct theoretical underpinning and relies on a specific methodology and deals with one or several stages of the auction-driven procurement process (Figure 1-1). The investigation guided by these questions will lead to insights into how different aspects of the three problem areas determine reverse auction use, actors' behaviour and auction outcomes.

Online reverse auction is a business innovation that is here to stay. With this dissertation we hope to enhance the research into online reverse auctions and to help advance the practice of their use into a more mature stage of the life cycle.

1.2. Literature and Research Issues

1.2.1. Auction context

An auction is defined as "a market institution with an explicit set of rules determining resource allocation and prices on the basis of bids from participants" (McAfee & McMillan, 1987). The early literature distinguished four key auction mechanisms: English, Dutch, first-price sealed bid, and second-price sealed bid (Milgrom, 1989). It was demonstrated that under a set of assumptions, first-price sealed-bid auction is strategically equivalent to the Dutch auction, and the English auction is strategically equivalent to the second-price sealed-bid auction (Vickrey, 1961), which means that buyers in these pairs of auctions would follow identical bidding strategies in terms of revealing their valuations. The cornerstone of auction theory is the Revenue Equivalence Theorem, which states that under the assumptions of independent private values (IPV) and risk neutral bidders the basic types of auctions generate identical payoffs (Vickrey, 1961).

In analytical models, auction theory relies heavily on a number of strict assumptions about the auction setting and the properties of economic agents. The key assumptions state that: 1) auction is a single isolated event with a fixed set of bidders; 2) symmetric Nash equilibrium is based on assumed ex ante symmetry in the distribution of private information; 3) auctions rules are commonly known, firm and credible; 4) there is common knowledge of the distributions underlying private information (Rothkopf & Harstad, 1994).

Although the auction theoretical models reveal important properties of equilibrium and bidder's strategy in different auction formats, their empirical tests have often failed. The most vivid examples are, perhaps, the efforts to empirically test the Revenue Equivalence Theorem. Multiple attempts to empirically test the theorem in laboratory and field settings, found, at best, limited support for the theorem: more often than not, empirical results were contradictory to theoretical predictions (Coppinger, Smith, & Titus, 1980; Cox, Roberson, & Smith, 1982; Hansen, 1985, , 1986; Johnson, 1979; Kagel, Harstad, & Levin, 1987; Lucking-Reiley, 1999; Mead, 1966).

A key reason for the lack of empirical support for this and other theoretical models is that assumptions underlying these models are often incompatible with the context and participants' behaviour in empirical settings. One of the most restrictive assumptions is the assumption of symmetric behaviour. "Even when all aspects of the auction, including information, are ex ante symmetric, the assumption of symmetric behaviour may be untenable… In a wide variety of experiments in symmetric settings, the null hypothesis of symmetric behaviour can be overwhelmingly rejected" (Rothkopf & Harstad, 1994: 379). Unlike the idealized bidders in theoretical models, bidders in empirical settings are likely to be heterogeneous, e.g. in terms of their knowledge (expert vs novice bidders) (Lucking-Reiley, 1999) or relationships with the bid-taker (Zhong & Wu, 2006).

Particularly in the case of online reverse auctions, where suppliers bid for a buyer's contract via the internet and prices go down during the bidding (Jap, 2003; Van Heck & Vervest, 1998), there are a number of characteristics that make empirical settings considerably different from most theoretical models. Most models focus on physical goods with value expressed by price alone, whereas online reverse auctions increasingly involve more sophisticated value functions that can include value components beyond price (Jap, 2002). Bidding at reverse auctions is interdependent, as several auctions often take place simultaneously or in sequence (Jap, 2002). Requirements for winner selection often allow the buyer to choose the winner based on other criteria beyond price (Zhong, 2007), or the buyer can refrain from awarding the contract at all (Snir & Hitt, 2003). One author even speaks about the science of analytical auction modelling and the business practice as of two different worlds: "It is not clear whether the differences between these two worlds is due to poor communication and education (on both sides!), or whether the differences stem from a more fundamental contradiction and/or omission between how we model a buyer's and supplier's decision process (e.g., rational and profit maximizing) and what the reality truly is. Hopefully, academic contributions crossing the disciplines of operations management, marketing, economics and psychology will help close the gap and hence further the intelligent and effective use of auctions for procurement." (Elmaghraby, 2007: 24).

As a reaction to the discrepancies between abstract models and reality a new research focus has emerged, on the context in which auctions occur. From this perspective reverse auctions are seen as just one of the components of the procurement process (Elmaghraby, 2007), an element of business strategy (Pinker, Seidmann, & Vakrat, 2003) and as embedded in a series of interdependent events (Pinker et al., 2003). By focussing on auction context, researchers aim to provide insights into actors' behaviour (Engelbrecht-Wiggans, 2000), auction outcomes (Rothkopf & Harstad, 1994) and auction design (Rothkopf & Whinston, 2007). The interaction between an auction and its context is a two-way process: the context affects auction design and actor behaviour, while auction results lead to changes in economic relationships (Rothkopf & Harstad, 1994).

Understanding actors' behaviour (in particular, how it is defined by their prior history) is particularly important within this approach. For instance, Rothkopf and Winston (2007) suggest that a bidder's past performance or reputation can provide information for improving auction design (Rothkopf & Whinston, 2007). According to Engelbrecht-Wiggans (2000), "…there is a lot to be learned from trying to understand why real sellers do the things that they do, and why real bidders do the things that they do…" (Engelbrecht-Wiggans, 2000: 2).

In this dissertation we follow the above advice. Although in this thesis the discussion of the role of auction context is present to some extent in all empirical chapters, it is particularly important in Chapter 2. Specifically, we use the context to gain new insights into an issue discussed in a number of previous studies: the buyer's choice between reverse auctions and bilateral negotiations (Bajari, McMillan, & Tadelis, 2006). We look at the buyer's past interaction with vendors and investigate how this affects the choice of the allocation mechanism for their next transaction.

1.2.2. Procurement of services

We use the following common definition of a service: "A service is a process consisting of a series of more or less intangible activities that normally, but not necessarily always, take place in interactions between the customer and service employees and/or physical resources or goods and/or systems of the service provider, which are provided as solutions to customer problems" (Grönroos, 2000: 46). In the literature one can identify a number of properties of services (such as in the construction services or software development services) that have implications for auctioning. Such properties are project complexity, information asymmetry and information exchange between buyers and suppliers with regard to service contents and production costs, costly bidding in service auctions, and costly evaluation of bids and learning effects from past projects (Bajari et al., 2006; Goldberg, 1977; Snir & Hitt, 2003; Whang, 1995).

Goldberg (1977) noticed that the requirements for *ex post* customization (that are typical of many complex contracts, such as public utilities services) impose a high demand for information exchange between the buyer and bidders at the pre-contracting stage (Goldberg, 1977). When the need for information exchange is high, using auctions instead of negotiations with a potential supplier is likely to stifle communication and increase costs for the buyer (Bajari et al., 2006; Goldberg, 1977).

The information asymmetry that is associated with service complexity has been identified as a reason for high bidding and bid evaluation costs in the case of customised IT services. High costs can lead to consequences such as the buyer abandoning his auction without choosing a winner (Snir & Hitt, 2003). In another study, information asymmetry regarding software development costs in combination with the effect of vendors' learning result in a buyer lock-in effect in sequential auctions (Whang, 1995).

Although all of our studies deal with the procurement of services, the characteristics of services play an especially important role in Chapters 3 and 4. Chapter 3 looks into the costly bid evaluation at online marketplaces for IT services and investigates tactics that buyers use to reduce these costs. Chapter 4 deals with patterns of reverse auction use and the use of repeat vendors in the same marketplaces.

1.2.3. Buyer-supplier relationships

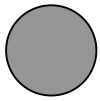
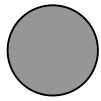
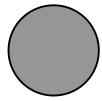
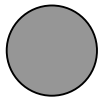
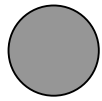
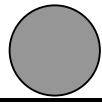
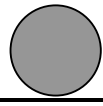
Buyer-supplier relationships have been one of the central issues in the studies of online reverse auctions in the domains of marketing, procurement, supply chain management and information systems research (Emiliani & Stec, 2004; James, 2003; Jap, 2007; Van Tulder & Mol, 2002). Due to their economic impact, online reverse auctions have often been seen as a double-edged sword. On the one hand, they optimize the procurement process, stimulate competition among suppliers (Carter, Kaufmann, Beall, & Carter, 2004; Jap, 2003) and result in lower prices for buyers (Jap, 2002). On the other hand, online reverse auctions can not only make suppliers concerned about the buyer's opportunistic behaviour (Jap, 2003) but, allegedly, also produce disruptive effects on buyer-supplier relationships (Emiliani, 2004). Below we discuss this in more detail.

A number of early studies argued that reverse auctions endanger or even destroy buyer-supplier relationships (Bartezzaghi & Ronchi, 2003) by compromising non-financial priorities such as quality (Nair, 2005), amplifying the bargaining power exerted on suppliers, conveying orientation on short-term financial gains (Emiliani & Stec, 2002), making suppliers suspicious of the buyer's opportunistic intentions (Tassabehji, Taylor, Beach, & Wood, 2006) and willingness to retaliate (Dani, Burns, & Backhouse, 2005; Emiliani, 2004). The procurement of commoditized direct and indirect inputs that is associated with arm's-length market relationships has been viewed as the primary area appropriate for the use of reverse auctions (Sawhney, 2003; Van Tulder & Mol, 2002).

Other researchers have been more optimistic with regard to the use of reverse auctions and their effect on buyer-supplier relationships. They have argued that reverse auctions can serve for supplier screening and as a "wake-up call" to existing suppliers (Jap, 2002), as a basis for the development and maintenance of long-term relationships (James, 2003), and can be associated with the elements of relational exchange such as long-term contracts (Pearcy & Giunipero, 2006), supplier cooperation (Pearcy, Giunipero, & Wilson, 2007; Smart & Harrison, 2003) and high levels of trust and quality (Radkevitch & van der Valk, 2005). One recent study in the context of the high-tech industry has quantified the effect of incumbency in reverse auctions. Incumbent suppliers have been found to considerably benefit from their past relationships with the buyer in comparison to new suppliers. Incumbents are three times more likely to win a contract than new suppliers and, when selected as winners, they provide buyers with less cost savings than new suppliers (Zhong & Wu, 2006).

Most previous research efforts have focused on the immediate impact of online auctions on buyer-supplier relationships (e.g. the level of suppliers' suspicions of buyer's opportunism after an auction event), rather then on the effects that reveal themselves over time. However, the effects that reveal themselves over time, during the process of project execution, have been barely explored. For instance, Pearcy and Giunipero (2006) ask: "Do suppliers (especially incumbents) harbour any feeling of the resentment towards the buying firm for mandatory participation in the electronic reverse auction that might impact the potential for the success of the relationship?" (Pearcy & Giunipero, 2006: 233). We address this knowledge gap in this dissertation.

Table 1-1. Focus of individual empirical chapters on the three problem areas.

	Chapter 2	**Chapter 3**	**Chapter 4**	**Chapter 5**
Service characteristics				
Auction context				
Buyer-supplier relationships				

The theme of inter-organisational relationships is most extensively addressed in Chapter 5, in which we look at the effect of auction outcomes on project stakeholders during the execution stage of a construction project and on how this translates into the effect on buyer-supplier relationships and performance in the project.

This section has briefly summarized the literature and outlined some key research issues regarding the use, processes and effects of online reverse auctions. In Table 1-1 we provide an indication of how aspects of each of the three problem areas are addressed by the empirical chapters (the relative size of the shaded circle is an indication of the extent to which a given theme is a addressed in the chapter). More in-depth literature reviews will be presented in the respective empirical chapters. In the next section we formulate the research objective and research questions.

1.3. Research Objective and Questions

The *overall research objective* of this dissertation is to enhance our understanding of the procurement of services via online reverse auctions (i.e. by addressing the gaps between theoretical models of reverse auctions and economic reality), specifically from the perspective of service characteristics, auction context and buyer-supplier relationships, and to extend the theoretical and managerial knowledge in this regard.

This dissertation consists of four empirical studies into the procurement of services with reverse auctions. These studies are driven by the discussion of the three problem areas above (procurement of services, auction context and buyer-supplier relationships) although these elements in each separate study exist in a unique combination.

Along with a common foundation, the studies are rooted in various mixes of literature and pursue independent research questions. The individual questions were formulated on the basis of the literature reviews in relevant areas and address the identified knowledge gaps. The detailed argumentation behind the research questions is provided in the four empirical chapters.

Chapter 2 uses the contract theory and auction theory to examine the effect of prior exchange relationships on the choice between auctions and negotiations in online markets for IT services. The research question we ask in Chapter 2 is: *What is the effect of buyers' repeat interaction with vendors and vendors' prior performance on buyers' choice between reverse auctions and negotiations?*

Chapter 3 is rooted in the auction literature and the literature on electronic markets, and looks into the tactics buyers use to cope with the costly bid evaluation and the effect of these tactics on project allocation on online markets for IT services. The research question we ask in this chapter is: *What is the effect of evaluation-cost-reducing buyer tactics on project allocation on online marketplaces for IT services?*

Chapter 4 is based on the transaction costs literature, and studies the heterogeneity of buyers on online markets for IT services. The research question is: *How do buyers organise their exchange relationships with suppliers over multiple transactions involving online reverse auctions?*

Chapter 5 studies the effects of reverse auction outcomes on relationships and performance in auctioned service projects during the project execution phase. It is rooted in the literature on role theory and organisational boundary spanning. Chapter 5 answers two research questions: *How do reverse auction outcomes affect the execution phase of auctioned contracts? What are the key relational competences of the boundary-spanning individuals that influence the effect of the reverse auctions on inter-organisational relationships and project performance?*

1.4. Relevance

1.4.1. Scientific relevance

Each of the studies centres on a specific research question and employs a dedicated methodology. This makes this dissertation scientifically relevant in several ways.

First, a general contribution of this thesis consists in advancing the understanding of reverse auctions for services across the three problem areas: auction context, service characteristics and buyer-supplier relationships. From the perspective of the auction context we will contribute to understanding reverse auctions by providing insights into how the buyer's exchange history affects the allocation mechanism choice, and how the buyer's tactics before and during auctions affect auction outcomes. From the perspective of service characteristics, we will explore reverse auctions in the IT service and construction industries, where factors such as service complexity and information asymmetry affect the use of auctions, the actors' behaviour, as well as the outcomes of auctions and auctioned projects. From the perspective of buyer-supplier relationships, the understanding of reverse auctions for service will be extended through the research into how buyers balance conducting repeat business with vendors with using reverse auctions, as well as into how outcomes of reverse auctions in the construction industry affect winning contractors.

Second, the more specific contributions of this thesis are those of the four individual empirical chapters, each of which will tackle a specific research problem and deliver results that can stand on their own academic merit. In Chapter 2 we address the issue of the buyer's choice between auctions and negotiations in the online markets for IT services, and extend the body of knowledge on the allocation mechanism choice (Bajari et al., 2006; Bonaccorsi, Lyon, Pammolli, & Turchetti, 2000; Leffler, Rucker, & Munn, 2003; Manelli & Vincent, 1995). In Chapter 3 we examine the tactics buyers employ to reduce their bid evaluation costs on online marketplaces for IT services and contribute to the literature on costly bidding and bid evaluation (Carr, 2003; Snir & Hitt, 2003). Chapter 4 addresses the heterogeneity of the buyer's procurement patterns within the same business context, and adds to the body of knowledge on the use of reverse auctions and buyer-supplier relationships (Emiliani & Stec, 2002; Gattiker, Huang, & Schwarz, 2007; Van Tulder & Mol, 2002). Finally, Chapter 5 looks at how auctions affect relationships and performance in auctioned service projects during the project execution phase in the construction industry, and further extends the literature on the effect of auctions on buyer-supplier relationships (Emiliani, 2004; Gattiker et al., 2007; Jap, 2002, , 2007; Pearcy et al., 2007)

1.4.2. Managerial relevance

The debate about the practical relevance of the research produced in business schools has taken place for as long as the business schools themselves have been in existence. The practical relevance is often seen as the opposite of another academic virtue – research rigour. As a recent article in *The Economist* puts it, most of the articles pub-

lished in academic journals are "highly quantitative, hypothesis-driven and esoteric" (Economist, 2007). The balance between relevance and rigour, apparently, it is not an easy one to maintain.

One challenge to the practical relevance of our research stems from the fact that some of its roots are in auction theory, which, despite all its rigour and academic brilliance, does not have a particularly good track record of being close to the practice of real-world auctions (Rothkopf & Harstad, 1994). Our answer to this consists in taking into account the empirical context of auctions and making use of the field transaction data to answer the research questions which bear a high degree of relevance per se.

We expect to generate practical insights for all auction stakeholders. In particular, for market makers/ auction designers we will provide insights into the design of auctions and the design of auction-driven online markets for IT services. For buyers there will be insights into the use of auctions and negotiations as well as into the tactics used to deal with the bid evaluation costs. Suppliers/vendors will benefit from advice on the role of project managers' skills in auctioned projects.

Our main strategy to ensure managerial relevance when carrying out the studies presented in this dissertation has been to be constantly in touch with the representatives of the industry and learn from their feedback. A considerable part of our data was obtained after we had communicated the motives and the purposes of the research to individual companies, after which they provided us with data or gave us an opportunity to collect the data. Some of the details of the research design, and sometimes even the research questions were amended during the process of interaction with the industrial context. Finally, after the data were collected, processed and analysed, we communicated and discussed the findings with the practitioners; our findings provoked considerable interest on their side.

The next sub-section will elaborate on the principles underlying the research methodology in the present dissertation.

1.5. Research Methodology

1.5.1. Research method selection

For the research problems in each empirical chapter we selected a particular research method, or a combination of methods, based on the state of knowledge in the respective area, and identified gaps in the literature and the challenges posed by the practice.

In choosing a research approach, the nature of the problem at hand and its context are crucial. Galliers, Markus and Newell (2007) emphasize the need to choose a research approach that can help tackle the research problem at hand in the most effective way: "…rather than simply choosing approaches with which they [research students and researchers] may be the most familiar, they may reflect on the efficacy of different approaches in light of their particular focus and subject matter" (Galliers,

Markus, & Newell, 2007: xi). Mingers (2001) argues that when the choice of research method is concerned, even the methodological paradigms such as positivism and interpretivism are less important than the context in which the research takes place: "In any case, it is possible to detach research methods (and perhaps even methodologies) from a paradigm and use them, critically and knowledgeably, within a context that makes different assumptions" (Mingers, 2001: 243).

Below we elaborate on the main methodological guidelines of this dissertation – the principle of methodological pluralism (Mingers, 2001) – and briefly discuss the methods employed to answer individual research questions.

1.5.2. Methodological pluralism

The term "methodological pluralism" has been coined by John Mingers as a reaction to a debate over different research paradigms in information systems research. These paradigms, such as positivism and interpretivism, rely on fundamentally different sets of assumptions about the nature of the world as well as about the nature of knowledge. The incommensurability of such assumptions (e.g. the belief that the world is given as objective and its laws are there to be revealed by the researcher versus the belief that the reality is socially constructed and subjective and is therefore subject to interpretation by the researcher) often divides researchers into different methodological camps. Mingers challenges such status quo by proposing that the different paradigms are "simply constructs of our thought" (Mingers, 2001: 243). He introduces a new paradigm, "methodological pluralism", that advocates the use of a combination of different research methods, because 1) the world is stratified and multidimensional, and 2) research studies consist of different stages that pose different tasks for the researcher (Mingers, 2001). We believe that different research methods are necessary at different stages of knowledge development, therefore we subscribe to Mingers' methodological pluralism.

In fact, methodological pluralism as a paradigm of combining different research methods can be conceptualized in different ways. First, as a loose pluralism, which allows for the existence of multiple research paradigms and methods within the IS discipline but does not prescribe the use of particular methods in particular research situation. Second, as complementarism, according to which different paradigms are associated with different research contexts, which makes them applicable to particular research situations to a varying extent. Third, as a "strong pluralism", where "all research situations are seen as inherently complex and multidimensional, and would thus benefit from a range of methods" (Mingers, 2001: 243). Mingers' article mostly advocates the third type of methodological pluralism. However, the research design employed in this dissertation as a whole falls more into the second type. In this dissertation we tackle four different research problems that, although focusing on several sequential stages of the procurement process within and around online reverse auctions for services, boil down to distinct and different research situations, each requiring an individualized dedicated methodology.

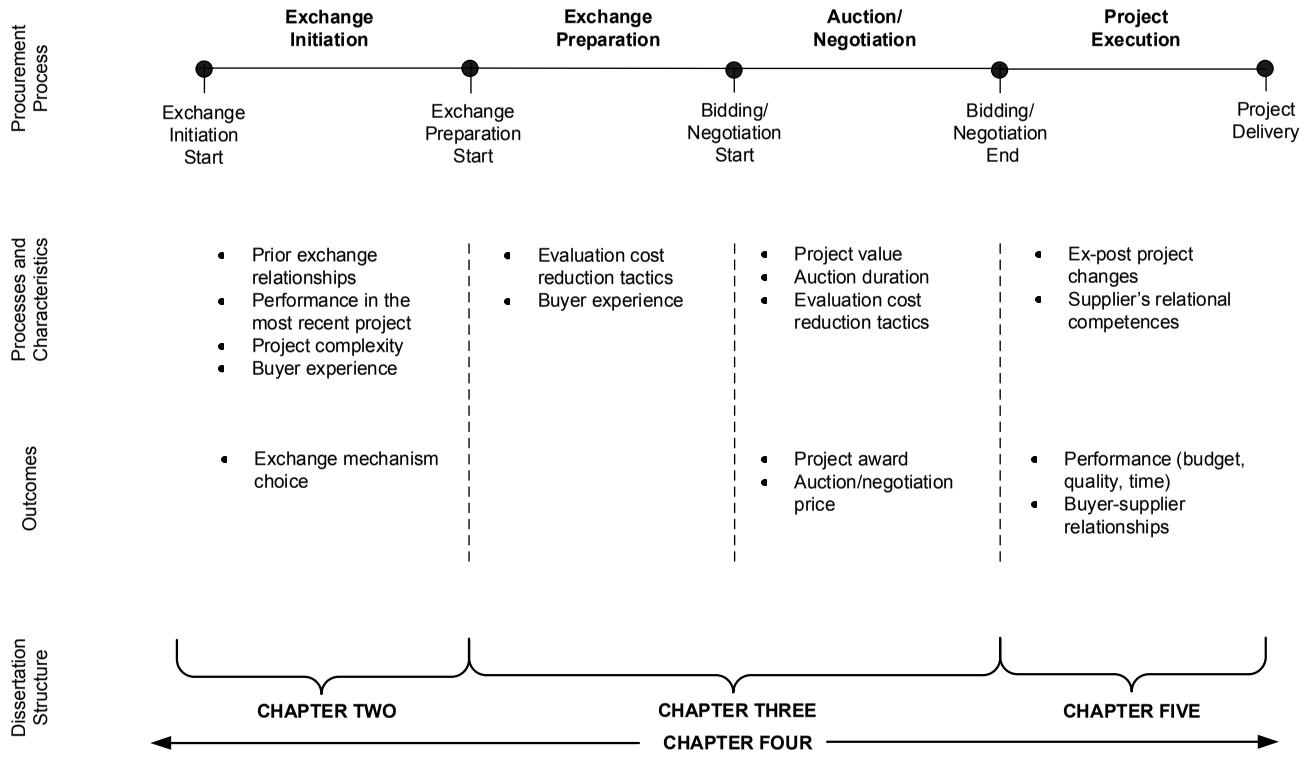


Figure 1-2. Procurement process using online reverse auctions: detailed dissertation framework.

In this dissertation we use a number of research methods that are predominantly associated with either positivistic or interpretive research paradigms. For each of the studies a methodology has been designed to provide an answer to the respective research question(s) as well as to cater for the corresponding research context. Details of the individual studies and the underlying methodology are presented in sub-section 1.5.3. An overview of these studies is provided in Table 1-3 (details on the focus, research question, empirical methodology, etc.) and Figure 1-2 (key constructs from the chapters and the stages of the procurement process each of the chapters addresses).

Three out of four studies in this dissertation are embedded in the context of online business (the fourth one deals with the building construction industry).

The next subsection explains the research methods utilized in this dissertation.

1.5.3. Overview of research methods

In this sub-section we provide a brief characterization of the specific methods employed to tackle the research problems in our four empirical chapters. We do this by dividing the discussion into three parts based on the main underlying research approach: deductive quantitative research, inductive quantitative research and longitudinal case study research.

Deductive quantitative research

Deductive quantitative research is, perhaps, the most widespread type of empirical investigation in the field of IS research as well as in business research in general. The reason for this is the traditionally strong orientation of business research towards formal theories and deductive types of reasoning, which brings our field into the same ontological stream with the natural sciences. Typical of deductive quantitative research is formulating hypotheses backed by formal theories and testing them with data collected through laboratory or field experiments, surveys, simulations or with archival data. Hypothesis testing relies on statistical techniques and is subject to a number of limitations, such as assumptions about the structure of the data and sample sizes.

Two of our studies are backed by the theoretical background sufficient for formulating testable hypotheses, and therefore utilize deductive quantitative techniques. These studies are presented in Chapter 2 and Chapter 3. In order to answer their respective research questions we collect two separate datasets from a leading online market for IT services and analyse them using statistical techniques such as OLS and logistic regressions, with a number of modelling nuances.

Inductive quantitative research

Deductive or confirmatory approaches dominate business research, including the area of information systems research. This status quo, however, is being questioned by opinions that consider the bulk of theory-driven business research to be of little rele-

vance for practice (Economist, 2007), and is challenged by studies that take a different, inductive perspective on knowledge generation.

Table 1-2. Overview of the research types and methods of the dissertation.

	Chapter 2	Chapter 3	Chapter 4	Chapter 5
Research	Confirmatory/ Deductive	Confirmatory/ Deductive	Exploratory/ Inductive	Exploratory/ Inductive
Data	Quantitative	Quantitative	Quantitative & qualitative	Qualitative
Method	Acquisition and statistical analysis of field data	Acquisition and statistical analysis of field data	Acquisition and statistical analysis of field data	Longitudinal case study

Both confirmatory and exploratory approaches to empirical research are used in the literature on both inter-organisational relationships and information systems research. Confirmatory approaches take a taxonomy deduced from the extant literature and test for the occurrence of pre-defined constructs and types, whereas exploratory approaches derive their taxonomy inductively from the data and then relate the resulting types back to theory. While traditionally the confirmatory approach has tended to dominate, exploratory approaches have been used effectively as well, particularly in situations where existing theory is deemed insufficiently detailed to do justice to the richness of the field setting. In the studies on inter-organisational relationships the exploratory approach has been employed to extract and analyze empirical patterns of inter-organisational relationships and sometimes to relate them to their antecedents and performance characteristics (Bensaou & Venkatraman, 1995; Cannon & Perreault Jr, 1999). In the information systems literature the exploratory approach has been used to develop the taxonomy of eBay bidders as well as to relate buyer types to the likelihood of-winning auctions and to buyer's surplus (Bapna, Goes, Gupta, & Jin, 2004), as well as to develop a taxonomy of industrial bidders at online reverse auctions (Zhong & Wu, 2006).

The advantage of the exploratory approach over the confirmatory approach is that the former allows for uncovering empirical patterns that can depict the limits of existing theories, while its disadvantage is that often there is little or no theoretical guidance for the selection of variables (Bensaou & Venkatraman, 1995). This disadvantage of the inductive method will be mitigated in our study by drawing on extant theories in selecting taxonomy dimensions as well as in explaining the resulting configurations and their properties.

By using the exploratory approach in Chapter 4 of this dissertation, we aim at developing an empirical taxonomy of buyers' portfolios of exchange relationships with suppliers in an online marketplace for IT services. Carrying out the empirical study in an online marketplace (specifically, within two categories of services – Web design and Web programming) allows us to isolate the context factors that are normally believed to affect the boundary of a firm, such as market complexity and asset specificity. This enables us to focus on the inherent heterogeneity of buyers' portfolios of supplier relationships.

Inductive qualitative research

In order to answer the research questions of Chapter 5 we have chosen a longitudinal exploratory case study design for the empirical investigation. A case study allows for the gathering of rich data on the phenomenon under investigation, including data on the context in which the phenomenon takes place (Pettigrew, 1990; Yin, 2002). The exploratory, or inductive, type of case study is particularly useful when theory-building is the goal of a research effort (Yin, 2002). In our case the inductive approach is appropriate because the body of knowledge on the effect of auctions on boundary spanners' relational exchange competences is not sufficiently developed to permit a deductive, hypothesis-testing investigation. In these circumstances, an inductive case study method allows for tracing the nature and workings of the boundary spanners' relational exchange competences in the great depth and detail that is necessary to inductively build up a basis for a theory.

The investigation of the effect of auction outcomes as well as the role and effect of boundary spanners' competences during the project run requires observation of causal relationships within and across a number of situations in which such effects manifest themselves. Such investigation is best served by a longitudinal type of study. The longitudinal aspect provides a rationale for a single case research design, due to its ability to deal with the theory that examines the change of certain conditions over time (Yin, 2002). It also improves the measurement validity and provides more space for alternative interpretations of data (Franz & Robey, 1984).

More specific rationales for using a longitudinal case study design deal with the nature of the investigated phenomenon. Studying relational exchange competences, i.e. factors that are connected with the dynamic realm of inter-organisational relationships, requires observation of relationships in their development, including changes in environmental characteristics and consequences of specific actions. Relationships may develop in an incremental way, where "for example, a small investment in the relationships by one party might increase the trust of the other party. With greater trust, the other party makes a larger investment that increases the trust of the first party" (Weitz & Jap, 1995: 311). Finally, collecting data on processes as they take place helps researchers to avoid reporting bias, which can be an issue when respondents have to report on a number of episodes that occurred at different points of time along the duration of a project.

Further details of the methods employed in the present dissertation will be discussed in the corresponding chapters.

1.6. Structure of the Dissertation

The driving idea behind the design of this dissertation is that each of the four studies should be able to stand on its own merit as an independent and self-contained piece of research in terms of the research problem, methodology and analysis, as well as the practical and theoretical contribution. Such a design facilitates the focus on topics of practical significance as well as the production of publications that is necessary for the research to be more "consumable" (Robey & Markus, 1998).

Consequently, the balance in this dissertation is shifted towards individual empirical studies, so that the literature reviews and in-depth methodology discussions are contained within Chapters 2 to 5. In this sub-section we present a framework that encompasses all four empirical studies.

The four empirical chapters deal with different stages of the procurement process. Figure 1-2 outlines key stages of the sourcing process that is common for transactions involving services such as custom software development or building construction: exchange initiation, exchange preparation, bidding/negotiation and project execution. Table 1-3 provides an overview of the key elements of the empirical chapters, such as focus, research question(s), methodology, empirical context, and others.

Table 1-3. Structure of the dissertation

	Chapter 2	Chapter 3	Chapter 4	Chapter 5
Focus	Allocation mechanism choice.	Buyers' tactics of evaluation costs reduction.	Taxonomy of buyers' portfolios of exchange relationship.	Effects of reverse auction outcomes on relationships and performance in auctioned service projects during the project execution phase.
Research question(s)	What is the effect of repeat interaction with vendors and prior performance on the buyer" choice between reverse auctions and negotiations?	What is the effect of evaluation-cost-reducing buyer tactics on project allocation in online marketplaces for IT services?	How do buyers organise their exchange relationships with suppliers over multiple transactions involving online reverse auctions?	How do reverse auction outcomes affect the execution phase of auctioned contracts? What are the key relational competences of the boundary spanning individuals that influence the effect of the reverse auctions on inter-organisational relationships and project performance?
Empirical methodology	Archival data analysis/ statistical analysis (regressions)	Archival data analysis/ statistical analysis (regressions)	Archival data analysis/ statistical analysis (clustering, ANOVA).	Longitudinal case study.
Level of analysis	Transaction/ Auction	Transaction/ Auction	Buyer's portfolio of relationships	Buyer-contractor dyad; project level
Key dependent construct or outcome	Allocation mechanism choice	Project allocation	Taxonomy of portfolios of buyer-supplier relationships	Boundary spanner's role constraints; project performance
Industry	IT services	IT services	IT services	Building construction

Chapter 2. Choosing between Auctions and Negotiations in Online Markets for IT Services

2.1. Introduction

In recent years auctions have received a boost from the rise of internet technologies and have become a common tool in corporate procurement, known as "online reverse auctions". However, the discussion relating to which transactions are appropriate for online reverse auctions to be used in as an allocation mechanisms has been intense both in the business press and academic literature. While some authors have embraced online reverse auctions as a way to optimize procurement, reduce prices, and contribute to process improvement (Smart & Harrison, 2002), others have warned about the potential negative impact on buyer-supplier relationships and supplier performance (Emiliani & Stec, 2002; Van Tulder & Mol, 2002).

Choosing the right allocation mechanism is particularly important for transactions involving customized products and services (Goldberg, 1977) such as unique manufacturing parts and equipment, building construction services or customized software. In such transactions buyers and suppliers can rely to a lesser extent on exhaustive specifications and ready-to-use industry standards (Snir & Hitt, 2003), and have to exchange more information regarding the product and transaction terms (Goldberg, 1977). Also, many projects such as those in the building construction industry are prone to *ex post* adjustments that are better dealt with by "cost plus" contracts (rather than fixed-price contracts), commonly associated with negotiations, rather than with reverse auctions (Bajari et al., 2006).

Past studies on allocation mechanism choice have focused primarily on factors such as product complexity (Bajari et al., 2006; Goldberg, 1977), preference for quality (Bonaccorsi et al., 2000; Manelli & Vincent, 1995; Tunca & Zenios, 2006), number of available bidders (Bajari et al., 2006; Bulow & Klemperer, 1996), costs of conducting auctions (Leffler et al., 2003) and non-contractibility (Mithas, Jones, & Mitchell, 2005). Negotiations are found to better facilitate information exchange when complex contracts are involved and the level of non-contractibility is high; they are also used when the buyer has a high preference for quality (Bajari et al., 2006; Bonaccorsi et al., 2000; Mithas et al., 2005). Auctions are favoured when contracts are less complex, the pool of available suppliers is large and costs of conducting auctions are lower than those of negotiations (Bajari et al., 2006; Leffler et al., 2003).

Past studies of the allocation mechanism choice were limited to isolated transactions. There is a concern that such a "discrete" perspective does not allow researchers to take into account other important factors that affect actors' behaviour and transaction outcomes (Elmaghraby, 2007; Pinker et al., 2003; Rothkopf & Harstad, 1994). These factors include information exchange (Goldberg, 1977), past relationships between partners (Jap, 2002), and expectations of future business (Heide & Miner, 1992). The latter factors are particularly important in procurement as buyers conduct transactions that tend to repeat over time between buyers and vendors (Elmaghraby, 2007; Pinker et al., 2003).

In this study we address this gap in the literature by studying the role of buyer's prior repeat interaction with vendors for the choice between reverse auctions and bilateral negotiations for her next transaction. Based on contracting and agency theory literature we elaborate on how repeat interaction with vendors is related to the benefits the buyer can reap in further transactions. Next, we argue that by choosing an allocation mechanism for the next transaction, the buyer also chooses to signal to what extent she trusts the repeat vendors, whether the buyer is willing to benefit from what the vendors have learned in previous transactions and motivate them to make further idiosyncratic investments. This way, we make explicit the link between prior exchange interaction and the choice of an allocation mechanism for the next transaction. The main question of this study is as follows:

> *What is the effect of buyers' repeat interaction with vendors and vendors' prior performance on buyers' choice between reverse auctions and negotiations?*

From the extant literature we identify several mechanisms (such as vendor learning in software projects (Whang, 1995), vendor's specific investments (Richmond, Seidmann, & Whinston, 1992) and costly bid evaluation (Snir & Hitt, 2003)), which provide a connection between the past buyer-supplier exchange interaction and the choice of allocation mechanism. Based on these insights we develop our argument and hypothesize that repeat interaction with vendors will favour the use of negotiations, while poor performance in the most recent project will lead to auctioning the subsequent project. Also, we hypothesize that, since new buyers need to explore the marketplace, they are also more likely to prefer reverse auctions as these are an appropriate tool for investigating the supply.

The testing of the hypotheses is conducted on a dataset collected from a leading online marketplace for IT services. Such marketplaces (examples include RentACoder, Elance and, Odesk) have been increasingly popular in recent years for small-scale IT services and other professional services, from website development to creative writing. For example, at RentACoder, a leading online marketplace for IT ser-

vices, over 7,000 IT projects are executed on a monthly basis, of which 95% are submitted by returning buyers[4]. In such marketplaces buyers use open reverse auctions and bilateral negotiations for project allocation, which makes this platform a suitable ground for our empirical investigation. The testing of our hypotheses is conducted on a sample of over 2,000 IT projects realized by 91 repeat buyers in the period of 1999-2006. The results of the analysis demonstrate that the more intensive prior repeat interaction is between buyer and vendors, the more likely the buyer is to use negotiation rather than auction to allocate her next contract. By contrast, auctions are preferred by buyers who want to switch to a different vendor when the performance of incumbents becomes unsatisfactory, or when buyers are new to the marketplace and need to explore the supply (although the latter effect is small).

The rest of the chapter is organised as follows. In Section 2.2 we start by reviewing the literature on allocation mechanism choice and contract choice, which is followed by hypotheses development, where we also draw on the literature on the economics of software development. In Section 2.3, we discuss the methodology of the empirical analysis and introduce the empirical setting in more detail. The results of the analysis are presented in Section 2.4. A discussion and conclusions follow in Sections 2.5 and 2.6.

2.2. Literature, Empirical Context and Hypotheses

2.2.1. Allocation mechanism choice

The choice of contract allocation mechanism in procurement affects such aspects of transactions as information exchange between buyer and supplier, supplier competition, pricing and, ultimately, performance. Some of the most widely used allocation mechanisms in procurement are reverse auctions and negotiations. Negotiations better facilitate information exchange when complex contracts are involved and the level of non-contractibility is high; they are also used when the buyer has a high preference for quality (Bajari et al., 2006; Bonaccorsi et al., 2000; Mithas et al., 2005). Auctions are favoured when contracts are less complex, the pool of available suppliers is large and the costs of conducting auctions are lower than those of negotiations (Bajari et al., 2006; Leffler et al., 2003).

[4] www.rentacoder.com visited November 12, 2007

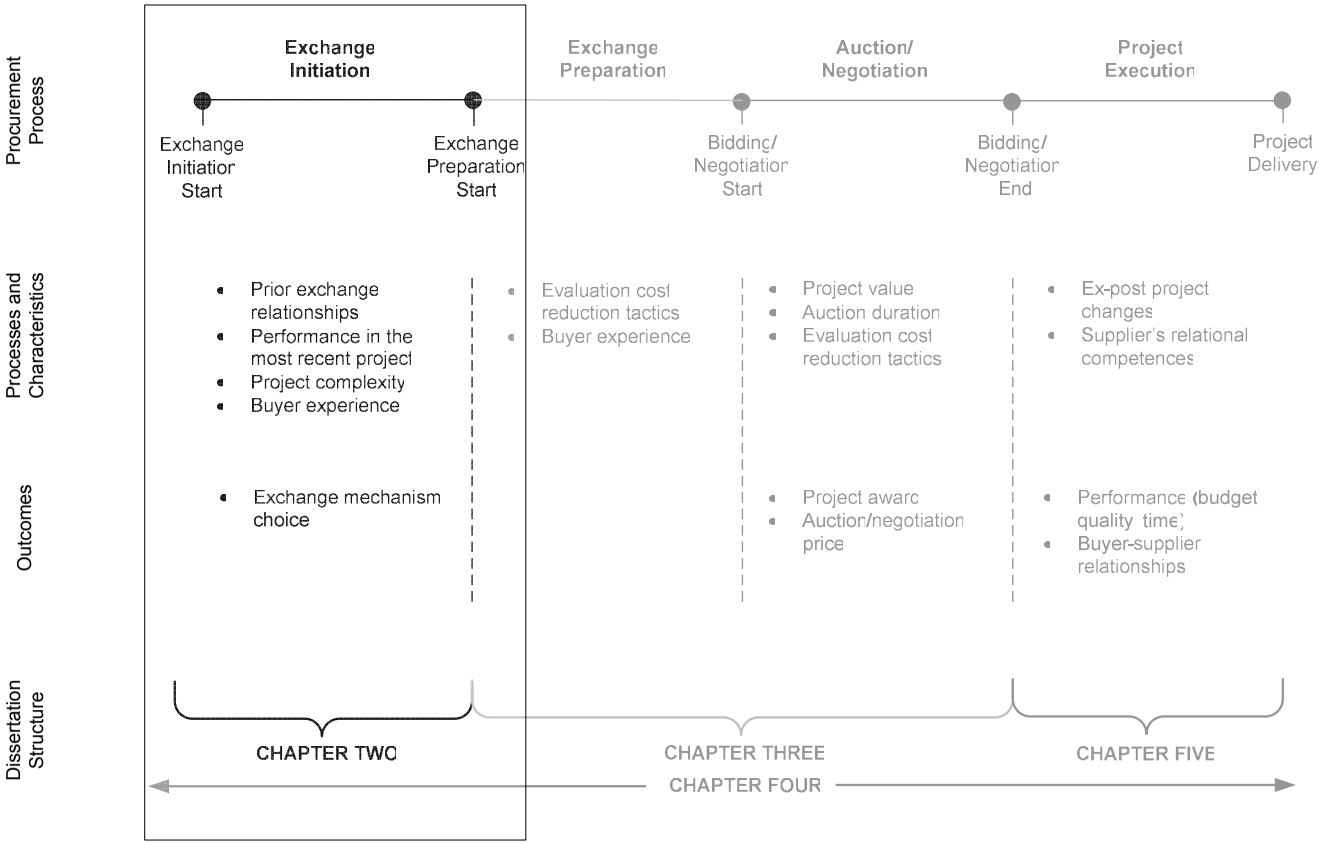


Figure 2-1. Chapter 2 in the context of the sourcing process.

An early study by Goldberg (1977) viewed auctions, along with other allocation mechanisms, primarily as a means of transmitting information between organisations, where product complexity plays an important role: "The properties (and the relative efficacy) of competitive bidding mechanisms will depend crucially on the subject matter of the bidding competition" (Goldberg, 1977: 250-251). Goldberg proposes that competitive bidding may not always be appropriate for complex transactions, such as the provisioning of public utility services, because the customization requires costly information provision at the pre-contract stage that can make this type of allocation mechanism too expensive (Goldberg, 1977).

This reasoning was taken further in Bajari et al. (2006), who focused on the implications of project complexity for the allocation mechanism choice and identified two reasons why higher complexity is better served by negotiation rather than auction. The first reason is the poor ability of an auction to facilitate information exchange when the input from suppliers is needed. In complex projects such information exchange is important, e.g. with regard to "how to deal with adaptation due to unforeseen events and problems" (Bajari et al., 2006: 9). Absence of information exchange can lead to adverse selection, where suppliers can submit low bids with an intention to extract profits from expected changes in the course of the project.

The second reason is that (in the context of the building construction industry where their empirical research was conducted) negotiations have been traditionally associated with "cost-plus" contracts and auctions are associated with fixed price contracts. A cost-plus contract is a more viable option for complex projects, where *ex post* adaptations regularly occur. An empirical test on the dataset of construction projects showed a positive association between project complexity and the use of negotiations (Bajari et al., 2006). Another finding of Bajari et al (2006) was a positive relationship between the number of available suppliers and the use of reverse auctions.

Similar results regarding the effect of project complexity and the number of available buyers were produced in a study of the sales of private timber tracts (Leffler et al., 2003). In addition, these authors found support for two other predictions grounded in the economics literature – that auctions are more likely to be used when the dispersion of the valuation of the good among bidders is higher and when using auction is cheaper than using negotiations (Leffler et al., 2003).

Other studies theoretically contrast price and quality as the factors of allocation mechanism choice. Manelli and Vincent (1995) consider an environment where the quality of goods or services is unknown to the buyer ex-ante and cannot be verified by the courts *ex post*. In their model, when the preference for quality is high the buyer is better off choosing sequential negotiations with potential suppliers instead of auctions (Manelli & Vincent, 1995). Tunca and Zenios (2006) consider the procurement of manufacturing parts, where high-quality parts can be procured from one supplier under a relational contract and low-quality parts are procured from the market via a second-price reverse auction. A high preference for quality leads to the procuring of

manufacturing parts from the relational contract, and a low preference for quality stimulates the use of reverse auctions, while there is also a situation of moderate preference for quality where the two mechanisms can co-exist and auction-driven competition can lead to the enhancement of self-enforceability of relational contracts (Tunca & Zenios, 2006). The link between the quality concerns and the choice for negotiations has been empirically validated in the context of the procurement of medical devices in Italian hospitals (Bonaccorsi et al., 2000). Along similar lines, Mithas et al (2005) hypothesized that buyers are less likely to use reverse auctions for procuring goods that are high on non-contractibility (this includes dimensions such as quality, supplier innovativeness, information sharing, responsiveness, trust, and flexibility) and asset-specificity, and confirmed the relationships though the analysis of survey data in the US automotive industry (Mithas et al., 2005).

Finally, an auction-theoretical analysis by Bulow and Klemperer (1996) in the context of selling a company showed that in the case when at least one additional bidder is expected to bid in the auction, the buyer should choose for an auction instead of negotiating (Bulow & Klemperer, 1996). The result holds for a case in which bidders' values are independent and, under certain restrictions, holds for affiliated values.

To our knowledge, no prior research into allocation mechanism choice has explicitly addressed the role of repeat contracting, while in the closely-related field of contracting literature it has been recognized as a major determinant of contract choice. We review these studies in the next sub-section.

2.2.2. Effect of repeat interaction on contract choice

Contract choice literature investigates the factors determining contract design using the logic of transaction cost economics and agency theory. This literature is preoccupied with identifying the effect of these and other factors on the preference for a particular contract form, or with identifying a contract form that maximizes buyer's value in an exchange situation with a given set of characteristics. Factors that affect contract choice include contract (project) complexity (Bajari & Tadelis, 2001), uncertainty (Kalnins & Mayer, 2004) measurement costs (Allen & Lueck, 1993), moral hazard (Lafontaine, 1992), supervision costs (Alston, Datta, & Nugent, 1984) and enforcement costs (Allen & Lueck, 1992). For instance, it has been found that project complexity is better dealt with by time and materials (in construction: cost-plus) contracts rather than fixed fee contracts (Bajari & Tadelis, 2001), the same as ex-ante uncertainty regarding the costs and project specification (Kalnins & Mayer, 2004).

More often than not, the analysis of contract choice centres on the characteristics of a given ex. situation, such as the ones listed above. It is only recently that the research attention has started to encompass also the history of interaction between contracting parties. There are a number of ways prior interaction can affect contract choice in a present exchange situation. Kalnins and Mayer (2004) summarize the factors identified by sociologists and institutional economists and identify four such mechanisms:

1) trust; 2) established pattern of collaboration and norms of interaction; 3) decrease of contracting costs due to accumulated contracting expertise; and 4) expectation of future business (Kalnins & Mayer, 2004).

Several recent empirical studies have addressed the effect of repeat interaction on contract choice. Gulati (1995) found that repeated alliances between partners are more likely to be set up without the use of equity than are first-time alliances. This is interpreted as evidence of the positive impact of trust established between the parties in prior alliance on the reduction of the suspicion of opportunism in the new alliances (Gulati, 1995). By contrast, in a study of the Indian software industry Benerjee and Duflo (2000) found no significant effect of prior contracts on the choice between fixed-cost, mixed and time-and-material contracts (Banerjee & Duflo, 2000). Despite these mixed earlier results, further evidence relating to the effect of repeat interaction on contract choice has been provided by two more recent studies. First, Corts and Singh (2004) argued that repeat interaction might alleviate the problems of contracting costs and the incentive problems in fixed-price and cost-plus contracts. In their empirical study of the offshore oil-drilling industry they found a positive relationship between repeat interaction and the use of day-rate contracts (equivalent to time-and-materials in software development contracting). This allowed them to argue that repeat interaction between contacting parties acts as a substitute for high-powered contracts (in offshore oil-drilling these are turnkey contracts) (Corts & Singh, 2004). Second, in another study of the software industry Kalnins and Mayer (2004) found a positive effect of repeat interaction measured on the site level on the choice for time- and material contracts, which is in line with the findings of Corts and Singh (2004).

In summary, most of the empirical studies have found that the presence of relationships affects the costs of monitoring and enforcing contracts and partly alleviates agency problems, which in turn has implications for allocation mechanism choice. As the earlier empirical studies into mechanism choice and contract choice showed that the empirical context plays an important role in the discussion of actors' behaviour and the implications of the contracts (Bajari et al., 2006; Corts & Singh, 2004; Kalnins & Mayer, 2004), we first introduce the empirical context in which this study is conducted before proceeding to the development of hypotheses.

2.2.3. Context: online marketplace for IT services

Contracting for software development is a complex endeavour characterized by information asymmetry with regard to production costs (Whang, 1995), intensive information exchange and heterogeneity of vendor quality (Snir & Hitt, 2003), high costs of preparing and evaluating vendors' proposals (Carr, 2003; Snir & Hitt, 2003), and the need for the vendor's specific investments to create value (Richmond et al., 1992). Our empirical investigation is set in a leading online marketplace for IT services that also shares these characteristics. Examples of online marketplaces for IT services include eWork.com, Elance Online, RentACoder.com, and oDesk. These marketplaces provide a platform for value-added exchange processes beyond the con-

tract allocation, such as payments, risk mitigation and service delivery (Kambil & van Heck, 2002; Snir & Hitt, 2003). The sector is growing fast. For example, the number of projects posted at Elance Online increased 78% to 150,000 in 2007; the total value of these projects reached USD 48 mln (Meyer, 2008). The volume of this market segment is projected to increase from around USD 250 million now to USD 2 billon by 2015.

We illustrate the functioning of such marketplaces with the example of Elance Online, one of the largest online marketplaces for professional services. One of the authors had professional experience in the IT outsourcing industry, as well as experience of selling and buying services in this type of marketplace. Additional insights were obtained from communications with an owner of another major IT service marketplace as well as several regular buyers of IT 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 60,000 companies regularly use the marketplace to buy services, and about half or more of them buy IT services (McDougall, 2005). The online marketplace 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 and other professional services such as language translation, creative writing, accounting, financial and business strategy consulting and the like. The Buyers are businesses and individuals coming predominantly from the US. The Vendors are mostly small and medium IT companies and freelancers from India, Eastern Europe and Russia. Some vendors have a turnover of more than two million USD within Elance.

The exchange process in the marketplace is organised as follows (Figure 2-1 provides an illustration of the key phases of the exchange process). First, 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. Two allocation mechanisms labelled "open auction" and "invite-only auction" are available to the buyer. A key characteristic of an open auction is that any vendor registered in the marketplace can submit a bid in response to an RFP posted in an open auction. Submitted bids, including all bid attributes, are either visible to all participants or, in a modification labelled "sealed auction", vendors can only see other bidders' identities, without bid details. A Buyer can send invitations to individual bidders to submit bids in auctions. In such case the names of invited bidders are listed on the web page with RFP and bidding details. The second type of allocation mechanism used in the marketplace is "invite-only auction", a mechanism the buyer normally utilizes when a project is intended for a particular bidder; no other bidders are allowed submit bids in invite-only auctions.

When posting an RFP as an open or invite-only auction, the buyer specifies procedure parameters, such as start and end time, auction type and the type of suppliers

who can bid. After the auction starts, vendors can submit bids. 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 (unless it is a sealed auction). During the auction, the buyer can decline or shortlist bids and communicate with individual vendors via a message board.

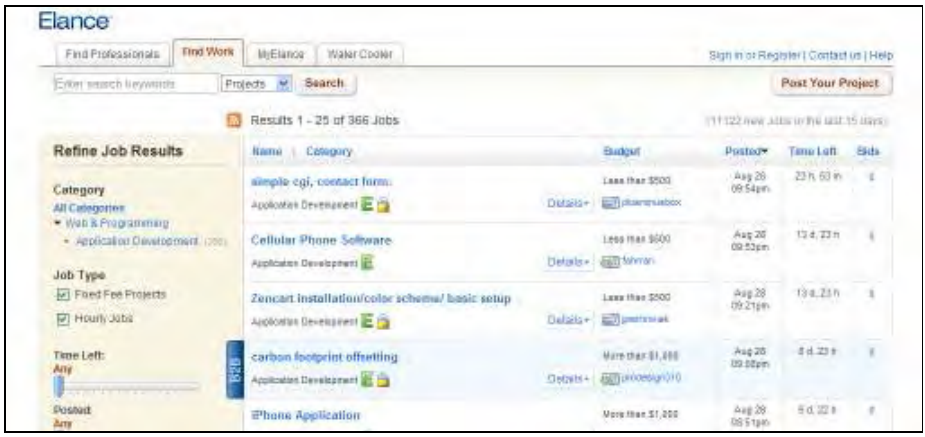


Figure 2-2. List of projects in the category "Application Development" at Elance Online.

2.2.4. Development of Hypotheses

We start with a simple intuition that new buyers in the online marketplace are different from experienced buyers in that they need to familiarize themselves with the marketplace and, especially, with the supply side. A straightforward and inexpensive way to explore the marketplace is through comparing vendors' offers at a reverse auction. This kind of intuition is supported by the insights from an analytical model that shows that reverse auctions are an important market exploration tool to identify new source of coffee beans supply (Donnet, Jeitschko, & Weatherspoon, 2007). Therefore, our first hypothesis is as follows:

Hypothesis 1. *New buyers are more likely to use reverse auction than experienced buyers.*

In an analytical investigation of the procurement of software development services, Whang (1995) developed a model of a vendor's bidding in a sequence of reverse auc-

tions for contracts, where the vendor's cost function incorporates the effects of learning that occur when a vendor has worked on a buyer's previous projects. By learning about the specificity of the buyer's request and by being able to modify and re-use parts of the source code, the vendor is able to cut the development costs dramatically in subsequent projects. The vendor who wins the first auction can create a lock-in effect and enjoy a competitive advantage against other bidders in subsequent auctions (Whang, 1995). As vendors learn in further projects, the lock-in effect becomes even stronger and the buyers become increasingly reluctant to switch vendors.

Several theoretical investigations have pinpointed the importance of vendor's idiosyncratic investments for creation of value. For instance, Bakos and Brynjolffson (1993) rely on the theory of incomplete contracts to develop a model, according to which suppliers are required to invest in non-contractible characteristics such as innovation, quality, flexibility, trust, information exchange and responsiveness in order to create value (Bakos & Brynjolfsson, 1993b). Richmond et al (1992), in their study of IS development outsourcing contracts, suggest that the value in outsourcing contracts is generated through vendor's specific investments, which can be stimulated though a profit-sharing rule (Richmond et al., 1992).

In the context of an online marketplace for IT services, it looks plausible that as buyers conduct more projects, learn about reducing development costs and the importance of specific investments and find ways to use vendors more efficiently, they will be increasingly eager to repeatedly use familiar vendors. But why would a buyer's willingness to stay with such a vendor prevent her from putting up new projects for open bidding?

First, as shown by Bakos and Brynjolffson (1993b), vendors' willingness to make non-contractible relationship-specific investments is subject to their expectation of being able to claim a part of the resulting gains in *ex post* negotiations. This depends on the vendor's ex post bargaining power, which becomes stronger as the buyer commits to a small, rather than large, number of vendors (Bakos & Brynjolfsson, 1993b). Using negotiations to allocate the next project allows the vendor to retain more bargaining power, which, although by itself negative for the buyer, also signals the willingness to give away some of the value created as a result of the vendor's specific investments, thus encouraging further relationship-specific investments that may ultimately benefit the buyer. Second, when considering allocating her next project via auctions or negotiations, the buyer might take into account the costs associated with setting up an auction and evaluate the vendors' bids. As was shown by studies of costly bidding and bid evaluation in the online IT service marketplaces, in such a setting the buyer incurs costs when evaluating vendor bids; at some point, the expected costs of evaluation can even exceed the expected gains from the transaction (Carr, 2003; Radkevitch, van Heck, & Koppius, 2007; Snir & Hitt, 2003). In other words, auctions might be a more costly procedure in the context of online marketplaces compared to bilateral negotiations, which is likely to make auctions a less attractive option compared to lower cost negotiation with a familiar vendor.

Third, recent empirical studies of the use of online reverse auctions in industry suggest that, when exposed to a strong competition in reverse auctions, vendors respond with an increased suspicion of buyer's opportunism (Jap, 2003; Jap, 2007). One can suggest that being suspicious of the other party's opportunism does not promote trust, willingness to cooperate or idiosyncratic investments, all of which are important factors in the success of IT projects.

Combined, these arguments lead to the following hypothesis:

Hypothesis 2. *More repeat interaction with vendors leads to the buyer's lower preference for auctions and higher preference for negotiations.*

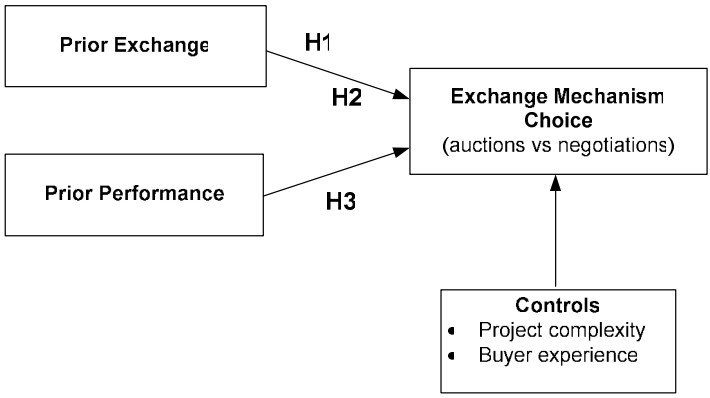


Figure 2-3. Conceptual model of Chapter 2: the choice of allocation mechanism.

Our last hypothesis deals with the effect of the vendor performance in the buyer's previous project on the choice of allocation mechanism for the next transaction. Due to their complexity and the involvement of parties that are often distributed across the globe, IT outsourcing projects are often prone to failure. According to PricewaterhouseCoopers, as many as 50% of outsourcing deals fail[5]. A vendor's failure to perform well can arise from a multitude of causes, such as the vendor's poor qualifications, project mis-estimation, resource constraints, problems in communication and cooperation between the parties during the project (Kern, Willcocks, & van Heck, 2002).

[5] http://www.engineeringnews.co.za/article.php?a_id=82203

Rather than continue with a vendor who has failed, the buyer is more likely to switch vendor. Reverse auctions are an ideal mechanism for performing such a switch, as they allow access to many new vendors, using competition to achieve a low price and comparing bidders against one anther. Therefore, we hypothesize that in such situation the buyer will opt for using reverse auctions rather than bilateral negotiations:

Hypothesis 3. *When performance in the most recent project has been unsatisfactory the buyer has a higher preference for auctions.*

The next section describes the methodology employed to test the hypothesized relationships.

2.3. Methodology and Data

2.3.1. Data

In order to test the hypotheses we collected transaction data on accomplished projects in a leading online marketplace for IT services. One advantage of using a dataset from an online marketplace is that it "captures unbiased objective data: what players actually did, rather than what they say they did. This is preferable to the kind of survey data commonly used in other outsourcing studies which tend to be dependent on inaccurate memory, *post hoc* rationalizations, and subjective attitudinal scales." (Gefen & Carmel, 2008: 13).

There were several stages in data collection and processing. First, we identified buyers who had at least 20 awarded projects in the marketplace (this number included projects awarded in any category of the marketplace, not only IT-related). This resulted in a sample of 530 buyers who had allocated 20 to 300 projects each, starting from the launch of the marketplace in 1999 until May 2006.

Second, we selected projects from the overall category *Web Development*, focusing on the four main sub-categories: *Web Programming, Web Design and Development, Simple Website* and a category labelled *Other – Web Design and Development*. Other subcategories existed within *Web Development*, but were not numerous enough in our sample to warrant inclusion. We excluded projects with incomplete data. We also removed projects with incomplete data, e.g. where buyer feedback on supplier performance was absent in this marketplace buyers have discretion whether or not to provide feedback to vendors on accomplished projects). To ensure a reasonable amount of feedback data for each buyer, we only included buyers for whom feedback on at least 70% of projects was available and for whom at least 10 projects belonged to the *Web development* category.

The data collection resulted in a dataset containing the transactions of 91 buyers, with data on 2,081 projects worth a total of USD 1,074,315. See Table 2-1 in the Appendix for descriptive statistics, and Table 2-3 in the Appendix for correlations between the variables.

2.3.2. Measures

Below we discuss the measures of the allocation mechanism choice, of complexity, buyer experience, repeat interaction and satisfaction with vendor performance.

Allocation mechanism choice

As discussed above, in the online marketplace where our empirical investigation is set the buyer has a choice of two allocation mechanisms, and we model the allocation mechanism choice as a binary variable where "1" is equivalent to the use of auction and "0" denotes the use of negotiations (or "invite-only auctions" in the parlance of our marketplace).

Previously-awarded projects

We use the number of projects awarded by the buyer prior to the current transaction as a straightforward measure of how "new" the buyer is to the marketplace. Therefore, a buyer with 0 previously awarded projects is accomplishing his first project in the marketplace.

Repeat interaction

We define the number of repeat interaction as the number of transactions the buyer had previously had with vendors with whom she had already transacted more than once. Although prior exchange interaction technically could stretch back through many years and/or projects, we focus on the more recent prior interaction as these are more likely to influence buyer behaviour than interaction many projects ago, thus providing a more focused test of the effects of the learning and specific investments that occur in early projects. We therefore counted repeat interaction with vendors within the buyer's five most recent projects. Therefore, the maximum number of repeat interactions for the buyer is 5, the minimum is 0. However, as a robustness check, we tested our model with an alternative specification of prior exchange relationships, where we counted vendor re-uses with the buyer's ten most recent projects, instead of only five. The significance and sign of the regression coefficient were practically the same as in our main results, but the effect size was even stronger.

Performance in the most recent project

After a project has been accomplished the buyer can assign a rating on a 1 to 5 point scale assessing the vendor's performance, and can leave a textual message in the vendor's public profile. As 91% of projects have a rating of '5', this suggests that 5 is the implied standard for any satisfactory project. We therefore modelled dissatisfaction with past performance as a binary variable where "0" is equivalent to the highest pos-

sible performance rating (5) in the previous project and "1" accounts for any rating below 5. As a robustness check, we also developed and tested two alternative specifications with benchmarks for dissatisfaction and 4 and 3, respectively. Testing both alternative specifications produced results similar to those of the main specification, although the effect of dissatisfaction was even higher.

Control variable - Project complexity

Past research has identified project complexity as an important factor that influences the choice between auctions and negotiations (Bajari et al., 2006). The data available from the online marketplace does not allow us to judge directly about project complexity. The closest proxy for complexity available in our dataset is the project category.

Project category. There are four project categories in the dataset: *Simple website, Web design and development, Web programming* and *Other – website development*. Using common sense it is hard to judge, which category contains more complex projects. For instance, *Web programming* could contain quite complex programming tasks; at the same time *Simple website* despite its name could be relatively complex if it required the specification of all elements of a website, such as layout, design and contents. To make things worse, the marketplace website does not provide a description of projects that are supposed to be posted in each of the categories, which might have made our guesswork easier.

An intuition that allows us to choose a relatively more complex category is that projects that end up in the category *Other – website development* may be, in fact, relatively more complex than those in other categories as they are less conventional and even less standardized than other IT projects. For instance, our examination of projects in this sub-category revealed that they span tasks such as screen savers development, converting .html files into .pdf format and vice versa, transferring websites to different hosting services, development of online games, website bug testing, and so on. Although this type of work is not necessarily very voluminous, it might be relatively more complex than more conventional tasks due to their one-off and unconventional nature. Indeed, descriptive statistics for auctioned projects indicate that projects in the category *Other – website development* have a description length almost twice as long as any other category (253 words versus 105, 114 and 123 words in the other three categories). The difference in the description length between *Other – website development* and other categories is statistically significant.

2.4. Analysis

In order to test Hypotheses 1 and 2 we focused on individual transaction as a unit of analysis. The descriptive statistics and correlations among key variables are presented in Table 2-1 and Table 2-3. Interesting insights emerge from both tables. As can be see from Table 2-1, buyers have allocated their projects via negotiations in 62% of

cases. This is roughly similar to the split between auction/negotiation use in the other studies of allocation mechanism choice (Bajari et al, 2006; Leffer et al, 2004), in both of which auctions and negotiations were utilized in approximately equal numbers of transactions. Average project price[6] in our dataset is around USD 516 while the average winner's bid is only USD 354. This is an indication of a certain amount of price adjustment during the project execution stage[7].

An average project is realized by an experienced buyer with an average of 14.1 previously awarded projects. Extant vendors succeed in winning almost 2/3 of projects (65%) The data indicates that negotiations serve primarily as a means of allocating projects to vendors with whom buyers have done business before – almost 90% of negotiations are done with such vendors. By contrast, new suppliers win 75.1% of auctions.

The mean of 4.88 of the vendor performance rating indicates that a bulk of vendors receive the highest possible evaluation for their project performance (91%). At least part of the explanation here is that awarding a vendor the highest rating serves as a reputational reward for good performance, rather than an objective measure thereof.

Other insights come from the correlation coefficients in Table 2-3. First of all, negotiations are associated with higher project prices as well as with higher winner's bids. A strong association (.66***) is between invite-only auctions and repeat vendors being selected as winners.

In line with the findings of some extant studies (Zhong & Wu, 2006), the price vendors are paid at the end of the projects tend to be higher for repeat vendors (.041*), and bids with which such vendors win are also higher (.069***). Also, projects involving repeat vendors have a higher satisfaction rating (.215***).

2.4.1. Analysis Strategy

Our dependent variable, allocation mechanism choice, is binary. Therefore, we employ a logit formulation and develop a statistical model that relates the probability of auction choice Pr(*Auction=1*) to a set of independent variables (*ProjectCategoryDummy*, *PreviousProject*, *RepeatProjects* and *DisatisfactionDummy*).

$$\log\frac{\Pr(Auction_i=1)}{1-\Pr(Auction_i=1)}=\beta_0+\beta_1 ProjectCategoryDummy_i+\beta_2 PreviousProjects_i+ \quad (1)$$
$$+\beta_3 RepeatProjects_i+\beta_4 DisatisfactionDummy_i+\varepsilon_i$$

[6] Price actually paid to the vendor after the end of the project.

[7] This is similar to construction projects, in which contracts are inherently incomplete and price adjustments are required in order to compensate for the changes in the scope of work and prices of construction materials.

Dummies for three project categories ("*Simple website*", "*Other – website development*" and "*Web design and development*") are used as *ProjectCategoryDummy*; the other dummy variable, "*Web programming*", is used as a benchmark. *PreviousProjects* is the number of projects awarded by the buyer before the current project; *RepeatProjects* is the number of repeat projects among the buyer's 5 most recent projects; *DisatisfactionDummy* is a binary variable set to "1" when the buyer's rating of the vendor's performance in the previous project was 5, and set to "0" if the rating was below 5.

The dataset has a panel structure and this has implications for the logit estimation procedures. The main issue with panel data is that the assumption of independent distribution of the error may not hold (Kennedy, 2003), which might result in biased estimation if a standard logit estimation procedure is used. In order to deal with this issue we use three different logistic specifications that together help test the robustness of our results. The first way of testing is by using pooled logistic regression with a robust procedure with clustering on buyers as the first way to test the hypothesis. This procedure allows us to obtain conservative standard errors and to avoid their inflation in the case that they are not independent.

There are ways, however, to more fully account for the structure of the data by capturing the effect produced by individual buyers on the allocation mechanism choice. Two candidate specifications for this are the random effects and fixed effects models. These two models differ in their underlying assumptions regarding the nature of the error terms resulting from individual buyers. The fixed effects model treats the effect of individual buyers as constant, in which case it becomes a part of the intercept. By contrast, in a random effects model the buyer-specific effects are assumed to be independently and identically distributed, coming from a common normal distribution. The random effects model produces more efficient estimations than those of the fixed effects model, since the former uses more information. The random effects estimator accounts for variation both within and between cross-sectional units – it is a "matrix-weighted average" of the between and within estimators (Kennedy, 2003: 307) – while the fixed effects estimator is based exclusively on the variation within cross-sectional units. However, for the random effects model to produce consistent estimates, the assumption about the independent distribution of buyer-specific effects should hold. This limitation greatly constrains the range of situations appropriate for the use of the random effects model (Kennedy, 2003).

One way to make sure whether the random effects model can be applied is by carrying out a Hausman test (Kennedy, 2003). The Hausman test verifies whether the estimates produced by the two models are statistically different. The statistical test is of H_0 that the estimates of the two models are the same versus H_1 that the estimates are different. No statistical difference means that the assumption of random effects cannot be rejected. Therefore, the random effects model can be used. In our case the

results of the Hausman test reported in Table 2-2 show that the random effects model cannot be rejected.

Finally, when estimating the fixed effects we need to account for the fact that our panel data is unbalanced, since the number of observations for individual buyers is too small to allow for a consistent estimation of individual fixed effects by the usual maximum-likelihood approach. A solution is to use approaches based on conditional maximum-likelihood. These approaches make possible the estimation of fixed effects in a consistent fashion (Greene, 2003). Therefore, we run a clogit procedure in STATA 9.0 that allows for consistent estimation of the buyer's fixed effects on the choice of the allocation mechanism, and report the result in column (5) of Table 2-1.

2.4.2. Results

In Table 2-1 the results of testing the logit models are presented. We start the discussion of the results with a concise form of the model that includes only proxies for project complexity and buyer experience (column 1). The initial test provides support for Hypothesis 1. The number of *Previously awarded projects* (our proxy for buyer experience) is negatively associated with the use of reverse auctions (-0.0380, $p<0.01$). Its effect is small, however: the marginal effect of an increase in *Previously awarded projects* from 0 to 1 is only around 1% of the auction probability decrease. Although small, this is in contrast to the results in Bajari et al. (2006). A possible explanation may be that in the online marketplace context investigated here, the positive effect of buyer experience on the use of negotiations is related to the fact that when buyers start their activities in the online marketplace, auctions serve as a tool to explore the marketplace, by getting to know vendors and learning about the bidding process. As buyers acquire experience, from exploration of the marketplace they switch to exploitation of their knowledge and the relationships they have built with vendors, where negotiation is a more appropriate instrument.

In line with our intuition, the dummy of the *Other – website and development* category negatively and significantly affects the choice for conducting an auction (-1.2075, $p<0.05$). This sign is in line with the results of Bajari et al. (2006), who showed a positive effect of project complexity on the choice for negotiations. Another category of projects that makes auctions significantly less preferred than negotiation is *Simple website*, although the size of the effect is smaller (-0.6046, $p<0.05$).

Table 2-1. The effect of project complexity, experience and prior performance and prior exchange interaction on the probability of choosing auction as an allocation mechanism: logistic regressions

Dependent variable: Auction	(1) Logit with robust standard errors and clustering on buyers	(2) Logit with robust standard errors and clustering on buyers	(3) Logit with robust standard errors and clustering on buyers	(4) Logit with random effects for buyers	(5) Logit with conditional fixed effects for buyers
"Simple website" dummy	-0.6046**	-0.5870*	-0.4289	-0.4853*	-0.4016
	(0.3065)	(0.3095)	(0.3721)	(0.2788)	(0.3045)
"Web design and development" dummy	-0.3717	-0.3578	-0.2372	-0.2833	-0.1908
	(0.2813)	(0.2781)	(0.2958)	(0.2343)	0.2602
"Other – Website dev." dummy	-1.2075**	-1.2142**	-1.4433***	-1.4817**	-1.2287**
	(0.5770)	(0.5854)	(0.3908)	(0.5747)	(0.6030)
Previously awarded projects	-0.0380***	-0.0366***	0.0042	0.0034	-0.0005
	(0.0114)	(0.0110)	(0.0094)	(0.0077)	(0.0079)
Buyer dissatisfaction dummy		1.1211***	0.3962	0.7391***	0.7640***
		(0.2584)	(0.2671)	(0.2683)	(0.2696)
Repeat projects			-0.8262***	-0.8981***	-0.7866***
			(0.0835)	(0.0646)	(0.0660)
Const	0.3518	0.2200	2.0004***	2.0061***	
	(0.2742)	(0.2775)	(0.2976)	(0.3084)	
d(E[Auction])/d(Previously awarded projects)[8]		0.0095			
d(E[Auction])/d(Satisfaction)[9]		0.2729	0.0865	0.1541	0.0649

[8] This row displays a marginal increase of the predicted probability of choosing auction when *DissatisfactionDummy* increases from 0 to 1, while other explanatory dummy variables are held at 0; continuous variables are held at their means.

[9] This row displays a marginal increase of the predicted probability of choosing auction when *DissatisfactionDummy* increases from 0 to 1, while other explanatory dummy variables are held at 0; continuous variables are held at their means.

d(E[Auction])/d(Repeat projects)[10]			-0.1282	-0.1632	-0.0508
Number of observations	2,081	2,081	1,780	1,780	1,357
Number of buyers	91	91	91	91	62
Wald Chi^2	22.08	51.35	150.90	234.83	238.50 (LR chi2)
Pseudo R^2	0.0493	0.0668	0.2599	0.3421	0.192
Log pseudolikelihood/ Log likelihood	Log pseudolikelihood -1317.986	Log pseudolikelihood -1293.672	Log pseudolikelihood -840.907	Log likelihood -713.622	Log likelihood -501.733

Notes: Dependent variable – probability of auction choice. Standard errors are in parentheses.

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

Next, we add the exploratory variable *Buyer dissatisfaction dummy* to the regression in order to test Hypothesis 3. The new model (column 2) marginally gains in explanatory power (Pseudo $R^2 = 0.0668$). The regression coefficient for *Buyer dissatisfaction dummy* reveals a large positive effect on the use of reverse auctions (1.1211, p<0.01). This result provides strong support for Hypothesis 3, which predicted that the buyer's dissatisfaction with the vendor's performance in the most recent project provokes the buyer's desire to switch to a different vendor – an intention that is better served by an auction. It is quite telling that the marginal effect of the *Buyer dissatisfaction dummy* changing from 0 (the rating assigned to vendors is 5) to 1 (the rating assigned to vendors is less than 5) is high: the predicted probability of the buyer auctioning the next project increases by as much as 27%.

[10] This row displays a marginal decrease of the predicted probability of choosing auction with an additional accomplished prior project while other explanatory dummy variables are held to 0; continuous variables are held at their means.

Table 2-2. Hausman test of the differences in the coefficient of the fixed effects and random effects logit models in columns 3 and 4 of Table 2-1

Dependent variable: Auction	(1) Random effects model coefficients	(2) Fixed effects model coefficients	Difference (2)-(1)
"Simple website" dummy	-0.4853	-0.4016	0.0837
"Web design and dev." dummy	-1.4817	-1.2287	0.2530
"Other – Website dev." dummy	-0.2833	-0.1908	0.0925
Previously awarded projects	0.0034	-0.0005	-0.0039
Repeat projects	-0.898	-0.7866	0.1116
Buyer dissatisfaction dummy	0.7391	0.7640	0.0249

Notes: $Chi^2 = 32.87$; $Prob>Chi^2 = 0$

The third model presented in column 3 of Table 2-1 regresses the probability of auction choice on the full set of the independent variables. The number of observations in this model is 1,780, since a sub-sample of buyers with at least 5 awarded projects has been used for testing. In comparison to the previous model, this model demonstrates a sharp increase in the explained variance to the level of 25.99% of the variation.

The regression coefficient for *Repeat projects* is significantly and negatively related to the choice for the reverse auction (-0.8262, $p<0.01$), which means that Hypothesis 2 is supported. As the analysis of the marginal effects reveals in the same column, the increase of the number of repeat projects (which the buyer conducts within the five latest projects) by one leads to a 12.8% increase in the probability of not choosing to auction the next project. By contrast, the coefficient for *Buyer dissatisfaction dummy* loses significance. This is related to the fact that projects undertaken by relatively inexperienced buyers (with less than five awarded projects) and in which dissatisfaction with the vendor's performance is more likely due to the lack of experience and fit with the vendor are now excluded from the analysis. Also, the coefficient for *Previously awarded projects* loses its significance, most likely because the effect of buyer's experience in the models in columns 3-5 (which was small to begin with) is now absorbed by the *Repeat projects* variable.

Columns (4) and (5) display the results of hypotheses testing using random effects and fixed effects logistic models. There are 1,357 observations in the fixed effects model compared to 1,780 in the random effects model, as the former model excludes buyers that do not have variation in the dependent variable. Qualitatively, the results are very similar. The support for Hypothesis 2 has been provided once again. Both random effects and fixed effects models demonstrate support for Hypothesis 3, which links the buyer's dissatisfaction with vendor performance in the most recent project with the choice for auction in the subsequent project. The coefficients for *Buyer dissatisfaction dummy* in both models are positive and significant (0.7391, $p<0.01$ and 0.7640, $p<0.01$). The analysis of marginal effects shows that when the buyer's rating for supplier performance in the last project is less than 5, the buyer is 15.5% (random effects model) and 0.065% (fixed effects model) more likely to use auction in the next transaction.

Overall, the conclusion of the analysis is that Hypothesis 1 (on the negative effect of buyer experience on the use of auctions) finds partial support. New buyers are more likely to use auctions than experienced buyers, but the effect of marginal increase in experience on the decrease of negotiation use is quite weak and seems to be overridden by repeat interaction, when the latter is included in the model. Hypothesis 2 (on the relationship between repeat interaction and preference for negotiations in the subsequent project) and Hypothesis 3 (on the relationship between dissatisfaction with vendor performance in the previous project and preference for auctions in the subsequent project) find broad support. In the next section we discuss the implications of the findings.

2.5. Discussion

The findings of this study have a number of implications for both research and practice. First, from the research perspective, this study not only extends the body of knowledge relating to the use of different allocation mechanisms. It also provides further support for an emerging perspective in the research on auction, which argues for focusing not only on a discrete transaction when trying to explain participants' behaviour in auction outcomes but also on the business context in which such a transaction occurs (Elmaghraby, 2007; Pinker et al., 2003; Rothkopf & Harstad, 1994). We showed that taking into account a historical perspective of an actor's exchange interaction, more specifically prior repeat exchange interaction, results in gaining valuable insights into the motivation of the behaviour of economic agents.

Second, these results contribute to the debate on the use of online reverse auctions in industrial practice. A viewpoint shared by a number of researchers is that online reverse auctions, if implemented "with care", can be utilized with the incumbent supply base without necessarily damaging existing relationships (Jap, 2002). Indeed, previous studies have found that incumbent suppliers are more likely to win auctions than new suppliers, and toenjoy higher prices (Zhong & Wu, 2006), and that incumbents might still be willing to make idiosyncratic investments after reverse auctions even though they might start to suspect the buyer of trying to opportunistically decrease prices (Jap, 2003). A study in the banking industry revealed that, although the effect of a supplier marketing program has a higher effect in terms of buyer's switching decision, personal relationships still do play a role as a counterweight to switching (Wathne, Biong, & Heide, 2001). Although these prior findings look very plausible, the broader perspective on the use of online reverse auctions taken in our study reveals that buyers do not think reverse auctions to be very appropriate in the context of longer buyer-supplier relationships. We identified and quantified a clear pattern of decreasing use of reverse auctions as the exchange relationships between buyers and vendors become more extensive, at least in terms of the number of previous exchange interactions. The decrease of the probability of using reverse auction for the next project (although somewhat dependent on the model specification employed) could be almost 16% per additional past repeat project with a vendor. Apparently, this is a sign that buyers do not see reverse auctions commensurable with the trust, vendor's learning and idiosyncratic investments amassed during the prior interaction, and rather rely on negotiations to reap these benefits. By contrast, buyers turn to reverse auctions when they need to sever relationships with their incumbent vendor: being dissatisfied with a vendor's performance can boost the probability of auctioning their next project by as much as 27%.

These results can be useful guidelines for procurement managers who have a full discretion to use different allocation mechanisms with their incumbent supply base, es-

pecially in contexts where the knowledge and investments of, as well as the trust in, incumbent vendors are important for creating business value.

At the same time, the results of the present study should be generalized with caution. Unlike previous studies on the choice of allocation mechanism and contract choice that explored the empirical context in industries such as offshore oil drilling, hospital procurement or contracting for large-scale IT services, this study explores small-scale IT service projects in an online environment. One implication for the generalizability of results here is that larger companies might have formalized rules for the choice of allocation mechanisms that might prevent them from easily changing from one mechanism to another. For example, several studies have described the procurement auctions of electronic components or automotive parts, where buyers would use reverse auctions exclusively to choose suppliers (Jap, 2003; Zhong & Wu, 2006). This is also true for public procurement, e. g. of construction services, where buyers always have to use tenders when certain criteria (e.g. monetary volume of the project) are met (Bajari et al., 2006). Another implication is that the transaction costs can be lower in the online environment, which can make switching vendors easier. For example, these are the costs of a buyer's searching for new vendors, which are lower in online markets (Bakos, 1997).

In addition to the concerns about generalizability, this study has several other limitations. First, the Web Development section of the online marketplace that we studied is but one of the areas of the marketplace. It is not clear whether our findings would equally hold for other professional services such as tax consultancy, legal advice or language transaction, where the importance of a buyer's learning, trust and idiosyncratic investments might be lower than in the case of IT services. Second, the size of the contracts we studied is much smaller than the size of typical B2B software development contracts. As Gefen and Carmel (2008) note in a study that uses data from a marketplace similar to ours: "Such contracts span from three to six order of magnitude larger than the typical Rent A Coder contract and thus different marketplace behaviour is likely" (Gefen & Carmel, 2008: 11). The third limitation comes from the fact that it is difficult to compare the effects of prior relationships on the allocation mechanism choice with factors identified by prior studies, such as contract complexity (Bajari et al., 2006). The measures for complexity available for our marketplace lack the refinement necessary for drawing such conclusions. Finally, our dataset has been limited exclusively to projects that have been awarded and executed, and as previous studies in a similar marketplace have pointed out, as much as 60% of posted auctions never result in a contract between the buyer and vendor (Radkevitch et al., 2007; Snir & Hitt, 2003). The explanations offered by these authors are mainly in terms of costly bidding and costly bid evaluation, but both papers also found that projects with higher dollar value are slightly more likely not to be awarded. This implies that the auction part of our sample is likely to include somewhat smaller projects compared to the overall population of auctioned projects. However, this only provides a stricter test of our hypotheses, as the risk associated with high-value projects would make them theoretically more likely to be allocated through a negotiation

rather than an auction (although since data on the value of negotiated projects is not available for the marketplace, we cannot test this hypothesis). This does suggest that a misfit between project value and allocation mechanism employed might be an additional explanation for the high percentage of failed auctions, but this is beyond the scope of this chapter.

2.6. Conclusions

Procurement transactions often require a decision on the choice of a mechanism to allocate a contract to a vendor to be made at a very early stage. As the prior literature has demonstrated, the choice of the allocation mechanism is of crucial importance since this mechanism affects a number of critical aspects of transactions such as information exchange, price and buyer-supplier relationships (Bajari et al., 2006; Jap, 2002; Jap, 2003). All these factors affect performance in the exchange.

Previous theoretical and empirical studies on allocation mechanism choice focused on transaction attributes such as product complexity, the buyer's preference for quality, availability of suppliers and the cost of conducing auctions as factors determining the mechanism choice (Bajari et al., 2006; Bonaccorsi et al., 2000; Leffler et al., 2003; Manelli & Vincent, 1995). This means that until now the literature has considered only discrete exchange situations, ignoring the historical context in which exchange occurs in the real world. This has been a considerable gap for both theory and practice, as repetition is typical for procurement transactions (Elmaghraby, 2007; Pinker et al., 2003). This study aimed to bridge this gap and to extend the literature on the choice of allocation mechanisms by studying the effect of the buyer's repeat interaction with vendors on the choice between reverse auctions and bilateral negotiations.

This study makes three key contributions. First, we identified and quantified the effect of the buyer's repeat exchange interaction with vendors on the choice of allocation mechanism in the buyer's next transaction in an online marketplace for IT services. We also found that in cases when the buyer needs to explore the supply in the marketplace or when she is dissatisfied with the vendor's performance in the most recent project, the use of auctions in the subsequent project becomes more likely. These findings extend the body of knowledge relating to allocation mechanism choice.

Our second contribution is linked to the new insights into the use of online reverse auctions. Buyers who enjoyed prior repeat interaction with vendors and are satisfied with their performance, are very unlikely to start experimenting with reverse auctions. By contrast, reverse auctions seem to serve as a tool that new buyers use to explore the marketplace; or, alternatively, to compare and switch to new suppliers in the case that a vendor's performance has become unsatisfactory. This finding seems to challenge the insights of some prior studies that suggested that reverse auctions are likely

to be used as a "wake-up call for the extant supply base" (Jap, 2002). However, more research is needed to find out to what extent these findings hold in other empirical contexts.

The third contribution consists of exploring an empirical context different from that utilized by prior studies of allocation mechanism choice. This has allowed us to extend the study of allocation mechanism choice into the online environment, which has hosted an increasing number of transactions in recent decades. In addition, the use of the real transaction data from an online marketplace helped to overcome a limitation of previous research that studied the link between reverse auctions and buyer-supplier relationships using survey data. In our study, rather than relying on the information about actors' subjective intentions and perceptions, we could operate with the objective facts of actual transactions, showing that the increasing availability of large, real-world transaction data offers great opportunities for building empirically valid theories of B2B market behaviour.

Appendix Chapter 2

Table 2-3. Descriptive statistics.

	N	Min	Max	Mean	Std. Dev.
Allocation mechanism (Neg. = 0; Auct. = 1)	2,081	0	1	.63844	.4967
Project Price	2,081	5	15,150	516.25	1008.91
Winner's bid	2,033	1	8,750	354.18	502.77
Number of previously awarded projects	2,081	0	65	14.10	13.07
Winner is recurrent vendor	2,081	0	1	.65	.48
Percentage of previous projects with repeat vendors	1,980	.00	1.00	.3893	.4144
USD in projects with repeat vendors	1,980	0	52,660	4,162.19	6,423.18
Satisfaction	2,066	1	5	4.88	.53
Satisfaction with last project < 5	2,081	0	1	.09	.29
Satisfaction with last project < 4	2,081	0	1	.04	.19
Satisfaction with last project < 3	2,081	0	1	.03	.16
Days since the start of the 1st auction	2,081	0	2,321	548.56	481.09
Repeat projects within 5 last projects	1,780	0	5	3.34	1.63
Category "Web design and development"	2,081	.00	1.00	.4493	.4975
Category "Simple website"	2,081	.00	1.00	.2220	.4157
Category "Web programming"	2,081	.00	1.00	.2960	.4566
Category "Other – web design"	2,081	.00	1.00	.0308	.1727

Table 2-4. Two-tailed correlations (Pearson's)

	Auction	Price USD	Satis-fact.	Win bid	Winner is repeat vendor	Satisfaction most recent project < 5	Repeat proj within 5 last proj	Previously awarded projects	Cat SW	Cat WDD	Cat WP
Price USD	-.099***										
	(.000)										
Satisfaction	-.203***	.009									
	(.000)	(.668)									
Win bid	-.120***	.588***	-.011								
	(.000)	(.000)	(.626)								
Winner is repeat vendor	-.660***	.041	.215***	.069***							
	(.000)	(.063)	(.000)	(.002)							
Satisf. recent proj < 5	.173***	-.017	-.161***	.002	-.208***						
	(.000)	(.436)	(.000)	(.926)	(.000)						
Repeat proj. within 5 proj.	-.551***	.027	.206***	.043	.635***	-.258***					
	(.000)	(.253)	(.000)	(.074)	(.000)	(.000)					
Previous awarded projects	-.214***	.054**	.092***	.022	.236***	-.079***	.270***				
	(.000)	(.014)	(.000)	(.326)	(.000)	(.000)	(.000)				
Cat SW	-.085***	.010	.014	.076***	.099***	-.034	.151***	.105***			
	(.000)	(.659)	(.522)	(.001)	(.000)	(.116)	(.000)	(.000)			
Cat WDD	-.025	-.029	.030	-.057**	.001	-.010	.017	.024	-.483***		
	(.260)	(.189)	(.178)	(.011)	(.975)	(.642)	(.476)	(.281)	(.000)		
Cat WP	.128***	.034	-.054**	.002	-.101***	.039	-.154***	-.131***	-.346***	-.586***	
	(.000)	(.122)	(.014)	(.919)	(.000)	(.074)	(.000)	(.000)	(.000)	(.000)	
Cat Other	-.066***	-.027	.021	-.020	.038	-.007	.015	.030	-.095***	-.161***	-.116***
	(.002)	(.223)	(.338)	(.364)	(.082)	(.739)	(.530)	(.169)	(.000)	(.000)	(.000)

*p<0.1, ** p<0.05; *** p<0.01; Standard errors in parentheses.

Chapter 3. Coping with Costly Bid Evaluation in Online Markets for IT Services[11]

3.1. 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[12] yearly. Another example is RentACoder.com, a marketplace specializing in IT services that facilitates over 15,000 projects per month and is still growing at the rate of 50% a year[13]. 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 160,000 vendors from close to 200 countries to choose from. The exposure to an overwhelming range of suppliers and their offers online can require buyers to spend more effort on evaluating their options (Barua, Ravindran, & Whinston, 1997), 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 are 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 in online marketplaces, yet only a handful of studies have recognized its importance.

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[11] A paper based on this chapter is being prepared for the second review round at *Information Systems Research*.

[12] www.elance.com (accessed 25.06.2007)

[13] www.rentacoder.com (accessed 25.06.2007)

This importance is demonstrated by a connection between higher evaluation costs and the buyer's tendency to abandon the transaction, i.e. not allocate the project to any vendor at all (Carr, 2003; Snir & Hitt, 2003). From a buyer's perspective, as the expected costs of evaluating vendors or their offers go up, at some point they may overweigh the benefits of locating an efficient vendor, so that the buyer decides to forgo bid evaluation and quits the transaction (Carr, 2003). Empirical tests have 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 through reverse auctions (Snir & Hitt, 2003). High evaluation costs at least partially account for the fact that as little as 30-40% of requests for proposals in marketplaces such as Elance Online go beyond the bidding stage to the project award stage (Snir & Hitt, 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).

Evaluation cost reduction is likely to increase efficiency on both the individual and market levels. Prior studies have suggested marketplace design improvements and automatic evaluation tools to reduce evaluation costs (Barua et al., 1997; Snir & Hitt, 2003). The present study adds to these institutionally-focused factors another category of factors that have an impact on evaluation costs: the behaviour of the buyer in the marketplace. Whereas previous studies have regarded the buyer's behaviour as uniform and fixed, we argue that buyers have several tactics at 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 in 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 development, by empirical observations of online marketplaces as well as by the literature. Note, however, that these tactics are not exclusively used for evaluation cost reduction. For example, a 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, an effect 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 their 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 whether 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 show that buyer tactics are an effective means for coping with evaluation costs. We extended and tested the theory on the effects of evaluation costs on the transaction outcomes in an online environment. While previous studies focused on theoretical models of buyer behaviour in which evaluation costs were completely or partially exogenous, in the present study we have extended the theory by treating evaluation costs as an endogenous factor. These findings contribute to the bodies of literature on online marketplaces and auction theory by increasing our understanding of the relationship between buyer behaviour, evaluation costs and contracting decisions at reverse auctions within online marketplaces for IT services.

The chapter is organised as follows. Section 3.2 contains a review of the literature on online markets and reverse auctions. Section 3.3 presents the conceptual set-up and hypotheses. In Section 3.4 we describe the empirical setting of an online marketplace for IT services, introduce measures and present the results of our empirical tests. Sections 3.5 and 3.6 contain the discussion and conclusions.

3.2. Literature

3.2.1. Context: the online marketplace for IT services

An online market is defined as "an inter-organisational 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 have been central to the literature on online markets. Information and communication technologies were predicted to have drastic transaction cost-reducing effects, resulting in numerous implications for organisational forms, market efficiency and buyer and supplier behaviour (Bakos, 1991; Malone & Laubacher, 1998; Malone, Yates, & Benjamin, 1987). Specifically, at the level of buyers' and sellers' strategies the implications of search costs (Bakos, 1997), bidding costs (Snir & Hitt, 2003) and evaluation costs (Barua et al., 1997; Carr, 2003) have been 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 of a vendor of a non-standard product, namely a sequential evaluation strategy and a competitive bidding strategy (i.e. simultaneous evaluation). The authors show analytically that the buyer's expected total cost under a sequential strategy is always equal to or lower than that under 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 behaviour in online markets and showed that higher value projects attract more bidders, and that these bidders are of lower average quality (Snir & Hitt, 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 this chapter, 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 et al., 2004; Jap, 2007; Radkevitch, van Heck, & Koppius, 2006c; Zhong & Wu, 2006).

3.3. Conceptual Development

3.3.1. Context: the online marketplace for IT services

Since our hypotheses are to some extent contextualized within the specific online marketplace we study (an issue which we will address at the end of the paper in the discussion of the generalizability of the results), we first introduce the research context – an online marketplace for IT services. Such a 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 & Hitt, 2003) and production costs (Whang, 1995); therefore, these services are likely to entail substantial bidding and bid evaluation costs for the exchange counterparts (Snir & Hitt, 2003). Snir and Hitt (2003) provide a clear summary of the 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 & Hitt, 2003).*

Examples of online marketplaces that are now seeing an increasing number of contracts for IT services include eWork.com, Elance Online, RentACoder.com and oDesk. Contracts on 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 & Hitt, 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 as "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, a leading 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 60,000 companies regularly use the marketplace to buy services and about half or more of them buy IT services[14]. 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. The Buyers are businesses and individuals coming predominantly from the US. The 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 organised as follows. Before buyers and vendors can enter the exchange, they should go through a registration process. Every participant chooses a marketplace ID under which it can be identified in any transaction. 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 be-

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

comes 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 & Hitt, 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.

3.3.2. 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). 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 & Hitt, 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 so high as to "offset any gains from the reduced cost of search and communication" (Barua et al., 1997) and "perfectly acceptable bids" can be neglected by the buyer due to high expected evaluation costs (Carr, 2003). Carr's (2003) model specifically addresses the exchange on 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 whether 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 the 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 & Hitt, 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).

3.3.3. Coping with evaluation costs

The previous paragraph highlighted the effect of evaluation costs on buyers, but there are several tactics that buyers can employ to reduce their evaluation costs. The discussion of these tactics is inspired by practices in custom software development, by empirical observations of online marketplaces as well as by the literature (Elmaghraby, 2007; Kaufmann & Carter, 2004). 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 & Carter, 2004). The tactics we consider are search (for vendors), RFP preparation, budget announcement, bid filtering and negotiation with vendors. Figure 3-1 depicts these tactics placed along the timeline of a typical reverse auction event on an online IT service marketplace. The displayed sequence is rather indicative, as in a real situation the buyer can decide to search for more vendors after the 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 reduction of evaluation cost reduction[15]. 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 et al., 2003), therefore search is commonly used in many procurement settings (Pinker et al., 2003). 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).

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.

[15] This raises the issue of alternative explanations of the effects of these tactics. These are addressed in the Discussion section.

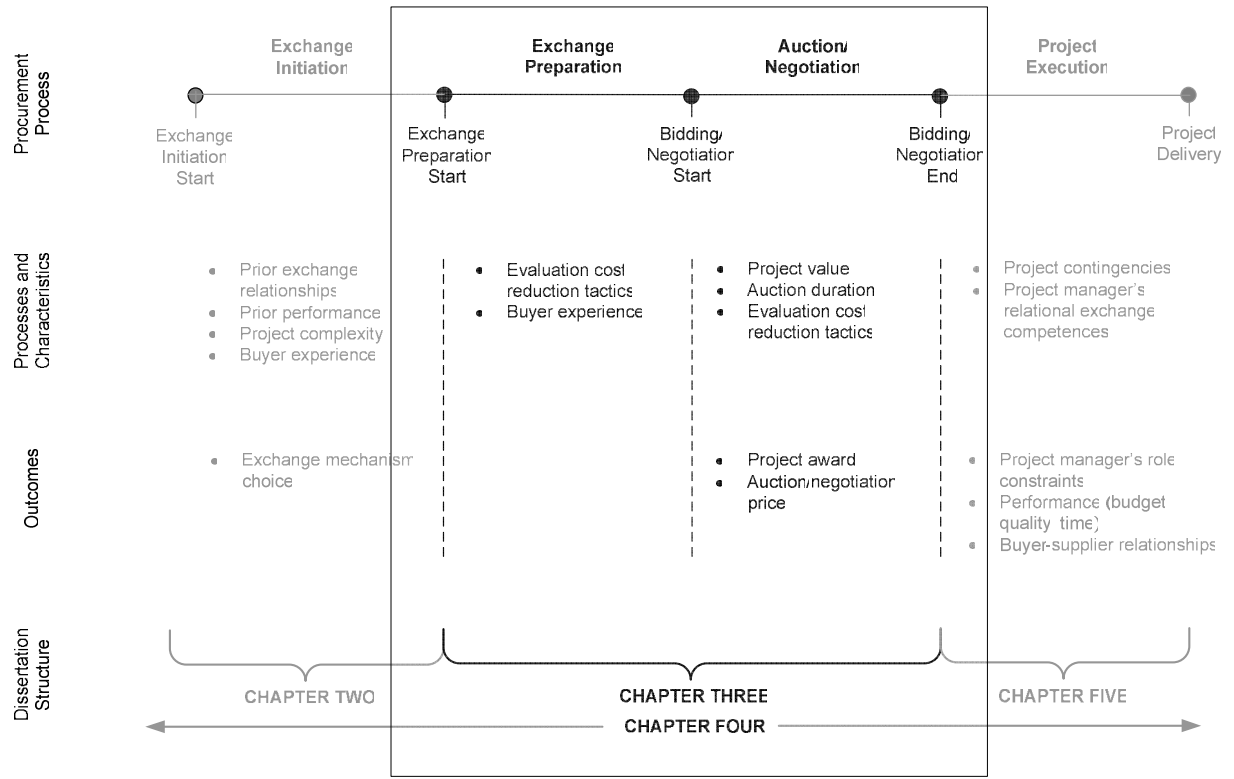

Figure 3-1. Chapter 3 in the context of the sourcing process / The use of buyer tactics along the timeline of the sourcing process at an online marketplace for IT services.

Below we discuss the 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 experiences 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 implications of evaluations costs as described in the previous literature (Barua et al., 1997; Carr, 2003; Snir & Hitt, 2003): the relationship between the use of tactics (potentially moderated by experience) and the likelihood of project allocation.

3.3.4. 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 the buyer's cumulative evaluation costs. First, when inefficient suppliers are deciding whether to submit their bids, the presence of already submitted bids from their more efficient (and invited) counterparts may prevent them from doing so (Snir & Hitt, 2003). Second, in the case that invited suppliers accept the 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 already been favourably assessed at the search stage.

As evaluation costs decrease, the likelihood of the buyer deciding to forego evaluation also decreases. Therefore, 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 an 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). It is expected that inefficient suppliers will refrain from submitting their bids once high quality/price requirements are announced. The announcement mechanism "can induce a separation between "efficient" and "inefficient" suppliers" (Barua et al., 1997). 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 specify the range of budget they expect to spend on the project. Linking this to the 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 effort in order 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 adapt-

ing his project description in accordance with the vendor's input and the 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 the 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 on just one parameter, such as vendor's rating, proposed delivery time or price. By utilizing bid filtering in order to exclude bids from inefficient vendors from the consideration 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 behaviour 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.

Buyer experience represents the outcome of learning from previous transactions on the online marketplace. This learning is likely to lead to the formation of efficient patterns or approaches to evaluation and to familiarity with some vendors (e.g. the buyer might be able to recognize early 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 the 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, to prepare more complete and professional RFPs, to obtain a more precise estimation of the budget and estimate the price/quality trade-off, and to 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.

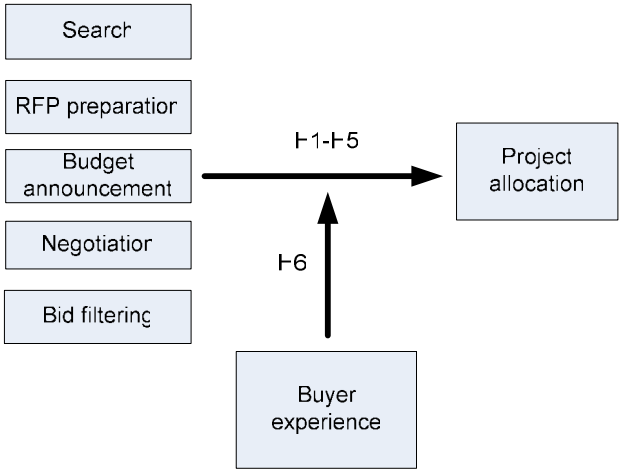

Figure 3-2. Conceptual model of Chapter 3. The impact of the buyer's evaluation cost-reduction tactics on project allocation, moderated by buyer's experience

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

The hypotheses are summarized in Figure 3-2. In the next section we discuss data and measures employed for empirical testing as well as the results of the analysis.

3.4. Data and Analysis

3.4.1. Data

The data for the empirical analysis was collected from a leading online marketplace for professional services, similar to the one discussed in Section 3.3.1. This site was 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 100,000 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 organised on the marketplace is typical for the industry, as

described in Section 3.3.1, 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 in the marketplace. This category includes 13 subcategories: Web Design & Development, 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, which allowed the programming of 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 USD 20,000 (8 auctions). After that, projects with very short project descriptions (below 5 words) were removed. Descriptions of this kind mostly refered to discussions between buyer and vendor and occurred 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.

3.4.2. 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 per buyer.

Search for vendors

Invited suppliers. When a buyer searches for a potentially suitable vendor and finds one or more, these 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 in 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. On the marketplace that we investigated, 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 the 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 modelled via the number of previously awarded projects in 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 has allocated at the marketplace prior to the current auction. One potential inaccuracy in this measure is that a buyer who has allocated four projects at four different auction events will have the same level of experience as a buyer who has allocated four projects in a single auction and has left other three auctions without awarding and thus would have somewhat less opportunity for learning from the experience of 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 the case that auctions had a "sealed" status, i.e. the value of the average bid was not disclosed, we used the winner's bid as a proxy for project value[16]. 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 the start until end of the auction. In cases in which the project is allocated to a vendor before the specified auction end, the end date is updated automatically.

3.4.3. Data analysis and results

Table 3-1 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; the 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 the software development industry (which is understandable if we remember that the majority of buyers and sellers in the marketplace represent small business and free-

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

lancers[17]). It seems intuitively plausible that for a buyer of such a project, committing time (and other resources, if applicable) to evaluate around 14 bids in depth (for 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 a/the buyer allocating the project to a vendor.

Table 3-1. Descriptive statistics for the dataset (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

[17] An additional reason for the modest value of the projects could be that most bidders come from low-cost countries such as India, China or Russia. The hourly cost of the IT workforce may be as low as USD 5-15/ hour – several times lower than in developed countries. Therefore, the cost of similar projects executed between customers and vendors in developed countries can be several times higher than the price on the online marketplace.

Budget announcement is by far the most popular tactic. It is used in 50% of auctions, compared to search (33%), bid filtering (25%), attached files (17%) and negotiation (12%). The average project description length is around 140 words. Around 17% of RFPs contain attached files with additional information about the request.

Table 3-2. The effect of buyer tactics on the increase of award probability: logit regressions and the marginal effect of changes in independent variables

Variable	(1)	(2)	Δ Independent variable (3)	Δ Award probability (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 ln(awarded projects)		-0.082* (0.048)	(M - st. dev.) to M	6.6%
			M to (M + st dev.)	6.6%
Budget announcement X ln(awarded projects)		0.085** (0.036)	(M - st. dev.) to M	11.5%
			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

When looking at the median statistics of previously posted (6) and awarded projects (3) we can see that the majority of buyers in 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. Table 3-3 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[18], 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:

$$\Pr(A_i) = \beta_0 + \beta_1 \ln(project\_value) + \beta_2 \ln(project\_duration) + \beta_3 \ln(invited\_suppliers) + \\ + \beta_4 \ln(description\_length) + \beta_5 Attached + \beta_6 Budget\_announcement + \beta_7 Communication + \\ _i + \beta_8 \ln(Declined\_bids) + \varepsilon \quad (1)$$

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 3-2, 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 any positive impact of search for vendors on project allocation (Hypothesis 1) is marginal at best.

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 the estimation of such an effect is to calculate the effect for a

[18] 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.

number of sets of "theoretically interesting and empirically relevant values of the variables" (Hoetker, 2007). 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[19]. The increase in ln(invited suppliers) by one standard deviation as per Model 2, Table 3-2 results in a 1.1% increase of award probability in each of the two intervals (Table 3-2, 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 3-2. 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 the RFP description results in an increase of award probability by 10.5% (Table 3-2, columns 3 and 4). However, the coefficient for description length is not significant. In a follow-up investigation, we observed that a substantial number of project descriptions on the lower end of the range, although longer than our initial conservative cut-off of 5 words, still do not provide any detailed description per se; instead, they may contain a link to a website which the buyer wishes to clone or a reference to a software product or a discussion between the buyer 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 effort in 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 shows that a

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

buyer who specifies his budget level would be 2.1% more likely to award the project than a buyer who does not).

Hypotheses 4 and 5 on bid filtering and negotiation both find strong support from 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.

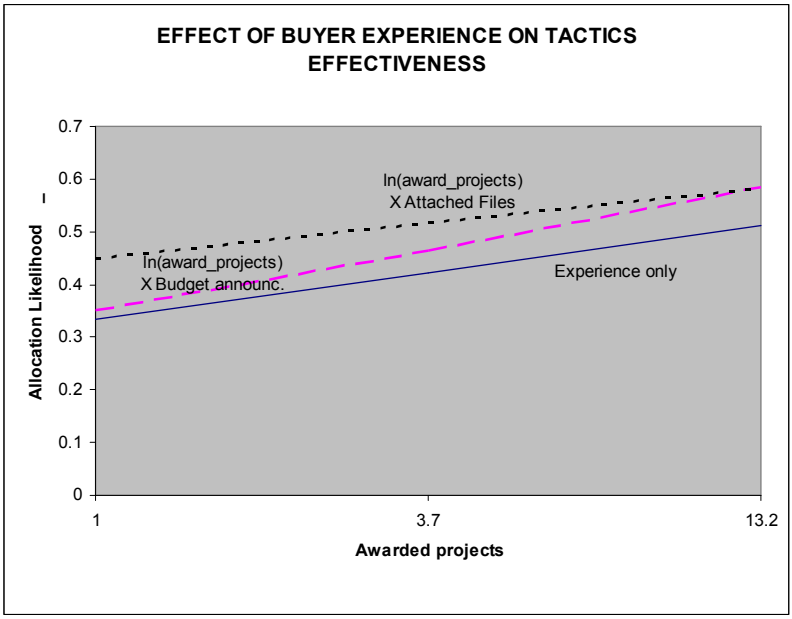

Figure 3-3. The effect of the interaction between buyer experience and individual tactics on project award likelihood[20].

[20] "Experience only" means that dummy variables are set to 0, while other variables are set to their means.

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.

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 in Figure 3-3[21]. 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.

3.5. Discussion

3.5.1. Discussion of the findings

In the present study we have 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 offers (bids). We treated evaluation costs as an endogenous factor of buyer behaviour and discussed several tactics that are likely to affect the 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

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

threshold of 10 words. The findings on the effect of buyer experience on the effectiveness of buyer tactics have confirmed only part of our expectations. In addition to a positive main effect, experience increases the effectiveness of Budget announcement, but reduces 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[22].

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 the 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 the 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 appropriate suppliers.

Also, we need to ensure that the observed effects are indeed the result of decreasing buyer's evaluation costs, rather than some other consequence 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 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 this 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

[22] 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.

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 regard to the employment of *ex post* tactics, the correlations in Table 2-4 show that 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 including a component aimed at reducing evaluation costs.

3.5.2. 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 the 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 relates 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 method 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"(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 an environment could 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 their project. After obtaining such information, the buyer can resort to off-market vendors and use this as a leverage to obtain favourable conditions for the off-market deal. One could suggest that investing effort in the sourcing process by applying the identified tactics can be a sign of the buyer's commitment to transact on the marketplace, while an opportunistic buyer would try to avoid additional effort and costs if he treats an auction merely 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 significantly different from the full dataset[23]. 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 on the online marketplace. Indeed, we only trace the presence of invited vendors at an auction and references to message board discussions in bids instead of directly measuring relevant efforts (e.g. time spent on searching 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 be expected to be stronger, rather than weaker. To provide a more comprehensive account of 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 from 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 behaviour of larger companies would be more sophisticated than that of small companies. Also, further testing is required to find out whether these findings would be applicable across other categories of professional services, such as creative writing or marketing consulting.

3.6. Conclusions

The evaluation costs buyers incur when assessing purchasing alternatives on online markets, especially for complex and idiosyncratic products and services, are a key factor for the outcomes and efficiency of transactions (Snir & Hitt, 2003). This study contributes to the literature on electronic markets by providing empirical support to theoretical reasoning on costly bid evaluation by testing the direct implications 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 into evaluation costs this paper helps to further connect analytical models of auction theory and electronic markets theory with business practice.

We extended and tested the theory relating to the effects of evaluation costs on the outcomes of transactions in an online environment. While previous studies mostly focused on theoretical models of buyer behaviour in which evaluation costs were

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

completely or partially exogenous, in the present study we have extended 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 on 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 modelling, 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 researchers to extend the generalizability by ensuring control over interfering factors. Second, analytical modelling using auction theory can be applied to model buyer equilibrium behaviour with regard to the use of evaluation cost-reducing tactics. A third avenue to extend the research should involve conducting further field studies to test our findings in 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 in online marketplaces. For buyers of complex and idiosyncratic IT services the discussion of the five tactics provides a guide to a more efficient purchasing behaviour. By applying the tactics discussed above, 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 the 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 behaviour 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).

Appendix Chapter 3

Table 3-3. Two-tailed correlations (Pearson's)

	Number of bids	Project Value	Auction Duration	Average Rating	Award	Invited suppliers	Project Description	Attached Files	Budget	Declined	Negotiation	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

Chapter 4. Heterogeneity of Buyer-Supplier Exchange Relationships in Online Markets for IT Services[24]

When a project needs to be undertaken, requests for proposals will be transmitted or electronic want ad posted, individuals or small teams will respond, a network will be formed, and new workers will be brought on as their particular skills are needed. Once the project is done, the network will disband. Following the steps of young Linus Torvalds, we will enter the age of the temporary company. Malone and Laubacher (1998: 148).

4.1. Introduction

The proliferation of Information Technology (IT) throughout the world economy has inspired a number of perspectives on the changes in the role and place of suppliers in economic exchange. These perspectives cover an entire spectrum of buyer-supplier relationships, from distant and arms-length to closely intertwined and collaborative (Clemons, Reddi, & Row, 1993; Kumar & Christiaanse, 1999; Malone et al., 1987).

Early transaction costs analysis of electronic markets and hierarchies saw the main effect of IT in reducing coordination costs of exchange by decreasing asset specificity and the complexity of product description (Malone et al., 1987). In a number of exchange situations, IT was predicted to initiate a shift from the hierarchical governance of transactions towards market procurement of goods from independent suppliers.

A different set of arguments focused on explicit coordination of market transactions, which is costly due to the efforts needed to control transaction risks (Clemons et al., 1993). IT lowers the costs of explicit coordination by decreasing the specificity of assets required for explicit coordination and diminishing the costs of monitoring. The

[24] An early version of this chapter was presented at the *International Conference for Information Systems* 2006 in Milwaukee. A later version has been conditionally accepted for publication in the journal of *Decision Support Systems*.

result is a trend towards long-term outsourcing relationships with a limited number of suppliers, rather than arms-length or hierarchical governance (Clemons et al., 1993).

A complementary approach stressed the importance of suppliers' investments in non-contractible attributes of exchange, such as quality, supplier responsiveness, information sharing and innovation that are needed to create value in many exchange situations (Bakos & Brynjolfsson, 1993a; Bakos & Brynjolfsson, 1993b). The supplier is likely to make such investments only when it can expect to appropriate part of the resulting value, which is less likely to happen when a buyer plays a large number of suppliers against one another. As a result, in situations where the effect of non-contractible attributes is important for value creation, limiting the number of suppliers to few "partners" is the best strategy (Bakos & Brynjolfsson, 1993a; Bakos & Brynjolfsson, 1993b).

Yet another relevant insight has been provided by Holland and Lockett (Holland & Lockett, 1997). In an empirical study of multi-mode network structures they found that, rather than sticking exclusively to market or hierarchical governance, firms use both modes in parallel with several exchange partners, and the degree to which one mode prevails depends on market complexity and the asset specificity involved (Holland & Lockett, 1997). Close, integrated buyer-supplier relationships were found to be present in most cases.

In summary, most studies argue (although by presenting different sets of arguments) that in a wide range of exchange situations buyers would prefer to establish close, long-term exchange relationships with suppliers to maximize economic benefits. The question is whether practice corresponds to the theory.

A fresh impulse to the discussion on the role of suppliers in exchange relationships has come from the recent widespread adoption of online reverse auctions in corporate procurement. A reverse auction is an auction in which suppliers bid to fulfil a buyer's contract (Jap 2003). Reverse auctions enable buyers to boost competition among suppliers and cut contract prices considerably as a result (Beall et al., 2003). Not surprisingly, the party that suffers from the new procurement practice is incumbent suppliers. A number of studies report incumbent suppliers losing their buyer accounts to aggressive new suppliers (Emiliani, 2004; Jap, 2003). Reverse auctions do not seem to contribute to good buyer-supplier relationships, either with incumbent suppliers or with the new ones – both types report increased suspicion of buyer opportunism after taking part in reverse auctions (Jap, 2003). For the buyer, instead of savings, switching to a new, barely-known supplier may result in problems with contract execution, e.g. low quality level (Emiliani & Stec, 2002; Van Tulder & Mol, 2002).

At the same time, there is evidence of strategic use of reverse auctions by buyers as a part of sourcing strategy that involves other considerations beyond purchasing price reduction. Jap (2002) finds that buyers often use reverse auctions as a "wake-up call to the complacent supplier base" rather than to obtain a lower price (Jap, 2002), and

can allocate long-term contracts via reverse auctions (Elmaghraby, 2007). According to recent studies, incumbent suppliers are much more likely to win contracts than new suppliers and also enjoy price premiums over the latter (Elmaghraby, 2007; Zhong & Wu, 2006).

The diverse results of the studies on the effect of reverse auctions on buyer-supplier exchange relationships highlight the lack of a comprehensive picture. In particular, systematic evidence is needed on how buyers use reverse auctions over multiple transactions. The literature calls for more research in similar directions. For instance, Pinker, Shiedmann and Vakrat (2003) ask: "How does that option of saving through auctions compare to the option of building a relationship with a supplier and achieving cost reduction through integration?" (Pinker et al., 2003: 1478). A similar question comes from Elmaghraby (2007): "…if a buyer has used an auction once with success, should she continue to use it regularly, or should auctions be used infrequently and in combination with other procurement mechanisms?" (Elmaghraby, 2007: 19-20).

In this study we take an exploratory approach to theory building. We aim to develop a taxonomy of buyer-supplier exchange relationships and the accompanying use of online reverse auctions by investigating patterns of exchange relationships that form in practice. The research question of this study is:

> *How do buyers organise their exchange relationships with suppliers over multiple transactions involving online reverse auctions?*

Both confirmatory and exploratory approaches to empirical research are used in the literature on inter-organisational relationships and on information systems research. Confirmatory approaches take a taxonomy deduced from the extant literature and test for the occurrence of pre-defined constructs and types, whereas exploratory approaches derive the taxonomy inductively from the data and then relate the resulting types back to theory. While traditionally the confirmatory approach has tended to dominate, exploratory approaches have been used effectively as well, particularly in situations where existing theory was deemed insufficiently detailed to do justice to the richness of the field setting. In the studies of inter-organisational relationships the exploratory approach has been employed to extract and analyze empirical patterns of inter-organisational relationships and sometimes to relate them to their antecedents and performance characteristics (Bensaou & Venkatraman, 1995; Cannon & Perreault Jr, 1999). In the information systems literature the exploratory approach has been used to develop the taxonomy of eBay bidders and relate buyer types to auction winning likelihood and surplus (Bapna et al., 2004), as well as to develop a taxonomy of industrial bidders in online reverse auctions (Zhong & Wu, 2006).

The advantage of the exploratory approach over the confirmatory approach is that the former allows for uncovering empirical patterns that can depict the limits of exist-

ing theories, while its disadvantage is that often there is little or no theoretical guidance for the selection of variables (Bensaou & Venkatraman, 1995). This disadvantage of the inductive method will be mitigated in our study by drawing on extant theories in selecting taxonomy dimensions, as well as in explaining the resulting configurations and their properties.

By using the exploratory approach in this study we aim at developing an empirical taxonomy of buyers' portfolios of exchange relationships with suppliers in an online marketplace for IT services. Carrying out the empirical study in an online marketplace (specifically, within two categories of services – Web design and Web programming) allows us to isolate contextual factors that are normally believed to affect the boundary of a firm, such as market complexity and asset specificity. This enables us to focus on the inherent heterogeneity of buyers' portfolios of supplier relationships.

The scientific contribution of this study is that it reveals considerable heterogeneity of buyer-supplier exchange relationships, and explains the empirical types of relationships portfolios and the role of online reverse auctions. This provides a valuable addition to the literature on exchange relationships and exchange governance, as most previous studies predicted exchange relationships to be homogenous under a fixed set of exchange attributes. We also find that online reverse auctions are primarily an attribute of arms-length exchange relationships, in which the buyer stimulates supplier competition and switches suppliers often. In portfolios with closer exchange relationships that endure through recurrent transactions and where one supplier gets a considerable proportion of a buyer's business, non-competitive negotiations are preferred to auctions. However, our findings do not contradict previous studies that suggested that reverse auctions can be used for supplier screening in long-term relationships and for allocation of long-term contracts.

From a managerial perspective, we provide insights into how online markets for IT services could serve exchange relationships that rely on longer-term considerations.

The paper is organised as follows. In the next section, we start by discussing previous research on portfolios of buyer-supplier relationships. Then, we discuss taxonomy dimensions as well as antecedents and outcomes of portfolio configurations. This is followed by a discussion of the methodology, data, analytical procedures, and empirical results. Finally, we discuss findings and formulate conclusions and contributions.

4.2. Portfolios of Exchange Relationships

The concept of a relationships portfolio has been used in marketing for a comprehensive analysis of the supplier or customer base of a firm. The portfolio of relationships "captures the fact that relationships, like products, vary in their intensity and in the role that a firm plays relative to its stakeholders in the relationship." (Sawhney & Zabin, 2002) p. 316.

Some of the notable applications of the concept of relationships portfolio (and similar approaches) have been to analyze buyer-supplier relationships from the viewpoint of their strategic importance, supplier attractiveness and the strength of supplier relationships (Olsen & Ellram, 1997), the costs and benefits of the firm's customers (Johnson & Selnes, 2004; Turnbull, Ford, & Cunningham, 1996), the management of supplier relationships over time, as well as associated processes and technology (Sawhney & Zabin, 2002), the maximization of the value from supplier relationships through supplier investments in non-contractible exchange attributes (Bakos & Brynjolfsson, 1993a; Bakos & Brynjolfsson, 1993b), as well as to develop a typology of buyer-supplier relationships based on contextual factors and analyze portfolio properties and performance implications (Bensaou, 1999).

The objective of this paper is to explore empirical configurations of buyer-supplier relationships and buyers' use of exchange mechanisms. Therefore, focusing on the buyer's portfolio of supplier relationships as a unit of analysis is a logical option. Using this concept will enable us to capture key dimensions of interest in the development of a taxonomy.

The portfolio properties we intend to analyze need to reflect the characteristics of exchange relationships, the exchange mechanism and underlying business transactions. Reliance on these properties makes the taxonomy dimensions theoretically motivated in the light of the literature reviewed above (Bapna et al., 2004).

Below, we present an overview of the portfolio characteristics used as taxonomy dimensions and elaborate on their theoretical underpinning. We also identify several antecedents of portfolio configurations that are likely to influence portfolio formation and discuss portfolio performance.

4.2.1. Taxonomy Dimensions

Buyer-supplier exchange relationships

Our conceptualization of buyer-supplier exchange relationships is rooted in the studies of the effect of IT on the governance and organisation of exchange transactions (Bakos & Brynjolfsson, 1993a; Bakos & Brynjolfsson, 1993b; Clemons et al., 1993; Holland & Lockett, 1997). One-time exchange transactions with independent suppliers in a market setting represent the case of distant, arms-length exchange relationships. Such transactions are characterized by the search for, and competition among, suppliers, low costs of procurement (due to low production costs of market suppliers) and high costs of coordination. Market exchange is opposite in nature to transactions that take place in hierarchies, i.e. within organisational boundaries or closely-coupled bilateral relationships. A hierarchal form of exchange governance is characterized by low coordination costs that come at the expense of high costs of production.

Other empirically-motivated investigations have identified a multitude of intermediate governance forms and structures beyond pure market or hierarchies, where different

governance mechanisms can be used in parallel or together (Daly & Nath, 2005; Holland & Lockett, 1997; Poppo & Zenger, 2002). A number of studies have addressed governance forms referred to as "partnerships", "networks" or "close and long-term buyer-supplier relationships" (Bakos & Brynjolfsson, 1993a; Clemons et al., 1993). On the surface, such relationships are characterized by the buyer working with a limited number of stable suppliers for a longer period of time. The "blood" of such relationships, though, is cooperation and coordination as well as parties' investments in non-contractible attributes of exchange such as quality, responsiveness, information sharing, trust, and innovation (Bakos & Brynjolfsson, 1993a; Bakos & Brynjolfsson, 1993b; Clemons et al., 1993).

Exchange mechanism

Auctions and bilateral negotiations are key mechanisms used in economic exchange that are often contrasted in the literature (Bajari et al., 2006; Engelbrecht-Wiggans & Katok, 2006). An auction is defined as "a market institution with an explicit set of rules determining resource allocation and prices on the basis of bids from participants" (McAfee & McMillan, 1987). In reverse auctions suppliers compete online for a contract to supply goods or services to the buyer and the prices go down. On one hand, reverse auctions stimulate competition among suppliers (Carter et al., 2004; Jap, 2003) and make them concerned about buyer's opportunistic behaviour (Jap, 2003). On the other hand, reverse auctions are believed to be compatible with several dimensions of relational exchange and can be used to source long-term contracts (Elmaghraby, 2007; Radkevitch & van der Valk, 2005) in which collaboration can take place (Smart & Harrison, 2003). Therefore, the extent of the use of reverse auctions (as opposed to bilateral negotiations) by buyers is the second dimension of our taxonomy.

Transaction characteristics

Transaction cost economics regards transaction characteristics as a determinant of exchange governance (Williamson, 1985). A high level of transaction attributes such as frequency of transactions, asset specificity and technological uncertainty requires hierarchical governance to minimize the transaction costs. While hierarchies are efficient in keeping down the costs of coordinating complex transactions, market governance is advantageous when transactions are less complex and exchange efficiency is achieved due to low costs of production (Williamson, 1985). In a similar fashion, transaction attributes become important in the choice of an exchange mechanism. For instance, more complex construction projects, where *ex post* negotiations are likely, are found to be more appropriate for negotiations, while less complex contracts with no *ex post* negotiations can be subject to competitive bidding (Bajari & Tadelis, 2001). Therefore, our third dimension is related to the complexity of IT projects.

Antecedents and outcomes of portfolio taxonomy

We rely on several other theoretically relevant constructs as antecedents of the taxonomy of buyers' portfolios of supplier relationships. These constructs are buyer opportunism, buyer experience and portfolio performance. We draw on these constructs to shed more light on the emergence of buyer portfolios of supplier relationships, and explain their configurations.

At the same time, it should be understood that with the exploratory approach, it is not possible to formulate a priori hypotheses regarding the effects of these antecedents or how different clusters will affect the outcomes, since the number and properties of clusters are not known *a priori*.

Buyer opportunism

Buyer commitment and opportunism in online markets for IT services have been discussed in (Radkevitch, van Heck, & Koppius, 2006a), where the authors suggested that opportunism in online auctions is one of the reasons behind the relatively low project award rate in this type of marketplace. In their study, opportunism was explored on the level of individual transaction and shown to influence the likelihood that a contract will be awarded. In the present study we extend the use of this construct to the level of portfolio of relationships in order to explore its relationship to the way portfolios are organised.

Buyer experience

Taking into account the buyer's experience in the marketplace is important as more experience means, ceteris paribus, that a buyer has worked on more projects and with larger overall budgets. More experience and the time associated with it provides room for the development of close exchange relationships with suppliers.

Portfolio performance

Previous studies have found a connection between buyer-supplier exchange relationships attributes and exchange performance (Griffith, Harvey, & Lusch, 2006; Poppo & Zenger, 2002). Similarly, in the present study we intend to investigate how different configurations of exchange relationships are related to exchange performance.

The conceptual model in Table 4-1 summarizes the relationships between portfolio taxonomy dimensions (in the centre of the model), cluster antecedents and performance.

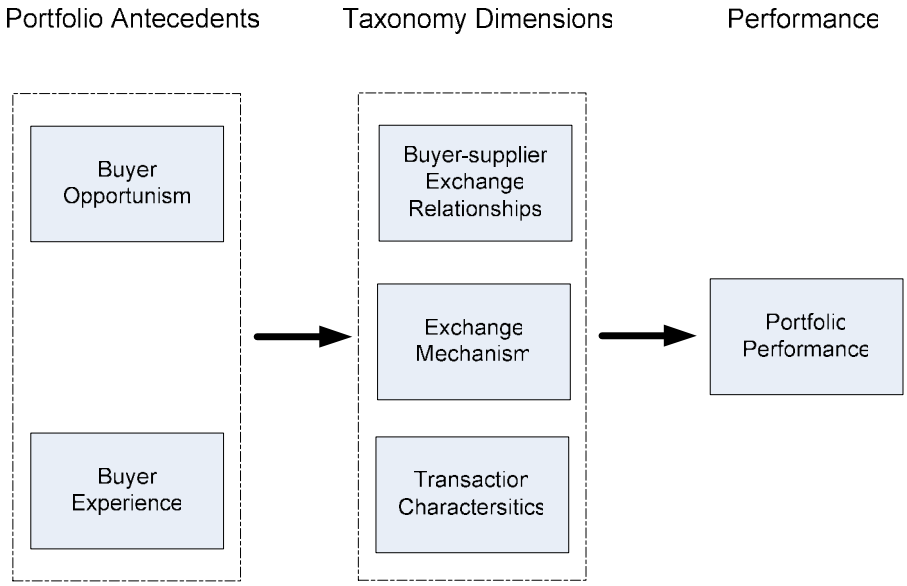

Figure 4-1. Taxonomy dimensions and antecedents and portfolio performance

4.3. Methodology

4.3.1. Empirical setting

According to Elmaghraby, "enterprising adoption of auctions for the procurement of services" is one of the key characteristics of today's landscape of online reverse auctions (Elmaghraby, 2007). In response to this trend, our investigation focuses on a leading online marketplace for IT services. Such an empirical setting is attractive as it is likely to contain both arms-length and close exchange relationships. On one hand, due to the development of Internet and IT outsourcing practices, especially to low-cost locations, many suppliers with similar sets of IT skills are available in the marketplace, which makes it highly competitive (Carr, 2003). Therefore, buyers should be able to choose between suppliers on the basis of price rather than other properties. On the other hand, IT services are highly idiosyncratic, the quality of suppliers is hard to assess *ex ante* (Snir & Hitt, 2003), information asymmetry is present with regard to production costs and there is huge potential for cost-savings due to supplier learning effects (Whang, 1995). This means that there is a space for value creation via non-contractible attributes of exchange, such as quality, supplier responsiveness, informa-

tion sharing and innovation (Bakos & Brynjolfsson, 1993a; Bakos & Brynjolfsson, 1993b).

The range of services transacted through the online marketplace encompasses IT services and other professional services (e.g. translation, accounting). Services related to website development represent the most popular area. The online marketplace is used by around 60,000 buyers, and contains over two thousand active projects at any point of time across all service categories and data on tens of thousands of auctions completed to date. By early 2006 the overall value of transactions facilitated by the marketplace exceeded USD 90 million. Buyers are businesses and individuals predominantly from the US, while suppliers are small/medium IT companies and freelancers located in India, Eastern Europe and Russia. Some of the most active suppliers have turnovers of over USD two million over the time of their presence in the marketplace.

The exchange process is organised as follows. Before buyers and vendors are able to enter the exchange, they are required to register on the website. Participation for buyers is free of charge while a periodic fee applies to vendors. The buyer starts an auction by posting an RFP (request for proposals). The Project allocation mechanism comes in two basic types: open auctions (all suppliers can bid) and invite-only auctions (only invited suppliers can bid). In 95% of cases there is only one supplier in the invite-only auctions, therefore we consider the invite-only auctions to be bilateral negotiations. In open auctions various suppliers are bidding and the buyer chooses the winner (which might not necessarily be the one with the lowest price).

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 & Hitt, 2003). When a project is awarded, 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 is able to rate supplier performance. The accumulated supplier rating is a part of the reputation and trust mechanism on the marketplace.

4.3.2. Quantitative data

We collected data on buyer activity from the Website Development sub-category of the marketplace. This is the most populated sub-marketplace, which allowed us to amass a substantial dataset of buyers busy with rather homogenous projects. This homogeneity is important in order to isolate potential effects of service type and complexity on exchange relationships. There were several stages in data collection

and processing. First, we focused on repeat buyers with a considerable exchange track record at the marketplace to ensure that each buyer had undertaken enough projects to make up a reasonable portfolio. We identified the most active buyers using a cut-off level of 20 awarded projects (this included all projects awarded on the marketplace, not only IT-related). This resulted in a sample of 530 buyers who had awarded 20 to 300 projects each, starting from the launch of the marketplace in 1999 until May 2006.

Second, we filtered out projects from outside IT categories (Web design and development, Simple Website and Web Programming) and projects with incomplete data, e.g. where buyer feedback on supplier performance was absent. In case if the feedback on at least 70% of projects was available (which is the cut-off level we chose, to ensure a reasonable amount of data in a portfolio), the portfolio was included in the further analysis.

The final check was to make sure that portfolios contain data only from either of the two rather homogeneous project groups: 1) Web Programming or 2) Web Design and Development combined with Simple Website projects. The latter two sub-categories were combined into a single group because an initial examination of the data had shown that the same suppliers tend to be active in both sub-categories.

The procedure resulted in 104 portfolios containing data on 2,167 projects, worth a total of USD 1,111,130. The data were standardized in order to avoid the disproportional impact of nominally higher variables in the cluster analysis. See Table 4-1 for descriptive statistics and Table 4-5 for correlations between the variables.

To extract data from the website of the online marketplace we used Kapow RoboSuite, a web data extraction agent; MS Excel and SPSS were employed at the stage of data processing and analysis.

4.3.3. Operationalization

Buyer-supplier exchange relationships. As discussed in the section on portfolio dimensions, our conceptualization of buyer-supplier exchange relationships relies on studies of the effects of IT on exchange governance (Bakos & Brynjolfsson, 1993a; Bakos & Brynjolfsson, 1993b). These studies drew a distinction between market-driven, arms-length transactions and close buyer-supplier relationships based on what can be described as two types of criteria that we refer to as "form" (number of suppliers and relationships duration) and "contents" of exchange relationships (investments in non-contractible exchange attributes and the relationship-specificity of other assets, including IT). The data in our dataset allow for the assessment of the form of buyer-supplier exchange relationships but do not contain systematic details on their contents[25]. However, knowing whether a buyer allocates a significant portion of busi-

[25] Anecdotal qualitative information about the contents of exchange relationships is available. We will draw on it in the analysis section.

ness to one or few suppliers or works with a wide range of suppliers, as well as knowing the duration of supplier relationships already provides us with a substantial basis on which to make a judgment relating to exchange relationships.

Table 4-1. Cluster dimensions, antecedents, outcomes – descriptive statistics

	Min	Max	Mean	Median	St. Dev.
Share of projects per preferred supplier (%);	0.08	1.00	0.545	0.500	0.282
Duration of relationships with preferred supplier (days).	0	1,439	483	434	332
Share of projects procured via open reverse auctions (%).	0	1.00	0.438	0.41	0.328
Portfolio size (USD)	1,066	52,380	10,684	7,302	10,256
Average project value (USD)	84	2,387	534	416	434
Average project length (days)	0	173	47.58	38.91	37.65
Number of awarded projects divided by number of posted projects*	0.40	1.00	0.82	0.86	.147
Overall number of awarded projects	21	210	68.91	51.50	46.17
Overall spend, USD	3,611	210,746	34,215	21,354	34,776
Duration of presence at in the marketplace (days)	120	2,353	1504	1,575	488
Average satisfaction rating	3.78	5.00	4.8673	4.9751	0.2264
Ratio: satisfaction with preferred supplier / average satisfaction	.97	1.32	1.0264	1.0008	0.0508

*Ratio awarded/posted: In our final dataset for 2,167 projects there were 2,142 auctions, making the overall awarded/posted ratio to be 1,012. This means that sometimes a buyer awarded projects to more than one supplier in a single auction. However, from the theoretical perspective we are interested here only in opportunistic buyers, who post projects without awarding them. Therefore, for the purposes of this research, to avoid distortion of data, awarded/posted ratios above 1 were replaced with "1" in 6 cases throughout the dataset.

Two variables operationalize the "form" of exchange relationships. We use *Share of projects per preferred supplier*[26] to assess the extent to which one preferred supplier can

[26] An alternative way to operationalize this dimension would be via the number of suppliers used by a buyer. One disadvantage of this measure, however, is that it cannot elicit suppliers that are relatively more import for the buyer when overall number of suppliers is high, e.g. if one supplier has

occupy an important role in the buyer's portfolio of exchange relationships. We define "preferred" supplier as a supplier who obtains the largest proportion of buyer's business in terms of the number of projects. A high share of projects allocated to the preferred supplier would indicate that at least one buyer has a high importance for the buyer. A low share would indicate that the buyer is likely to use an arms-length approach without favouring any supplier over others. It is important to note that this measure characterizes the whole portfolio of supplier relationships, rather than a buyer-supplier dyad. For instance, a high proportion of projects allocated to the preferred supplier (e.g. 75%) would mean that other suppliers, regardless of their number, have little weight and importance in the portfolio. If the preferred supplier receives a relatively small proportion of projects (e.g. 25%), this would mean that the buyer has an arms-length approach and treats all suppliers in an equally distant way.

The second measure, *Duration of relationships with the preferred supplier,* provides an indication of the time perspective of the relationships with the preferred supplier. Suppliers in longer relationships are likely to develop closer relationships with the buyer.

Exchange mechanism. In order to assess the use of reverse auctions in the buyer's portfolio, we use *Share of projects procured via open reverse auctions* as a straightforward measure. Since the buyer has only two options for the allocation mechanism – reverse auction or negotiations – the reverse of this measure accounts for the use of negotiations by the buyer.

Transaction characteristics. Three variables account for transaction characteristics. The variables *Average project value* and *Average project length* serve as proxies for project size and complexity (Snir & Hitt, 2003). *Portfolio size* is a characteristic of the volume of a buyer's transactions at the portfolio level, rather than at the level of a single project. Incorporating this measure allows us to assess whether, for example, buyers with large projects form different portfolios of relationships from buyers of small projects.

Buyer opportunism. According to (Radkevitch et al., 2006a), opportunistic (as opposed to committed) buyers in online marketplaces for IT services are inherently likely to conduct auctions without awarding projects to suppliers in order to receive free advice or for the purposes of price benchmarking. While their research was conducted on the level of individual projects, here we extrapolate this intuition to the level of buyers' portfolios of exchange relationships with suppliers. We use *Number of awarded projects divided by number of posted projects* as a proxy for opportunism at the portfolio level, as buyers with a lower level of this ratio seem to be more prone to opportunistic behaviour than buyers who award higher proportion of projects.

60% of business. In addition, our analysis showed that the number of suppliers and the percentage of projects allocated to the preferred supplier are highly (and negatively) correlated (- 0.782**). Since only using one of these two highly correlated variables would be appropriate for taxonomy development by the means of cluster analysis, we chose to focus on the Share of projects per preferred supplier.

Buyer experience. In order to capture different aspects of buyer experience in the online marketplace we operationalize this experience via three variables: *Duration of the presence on the marketplace*, *Overall number of awarded projects* and *Overall spend* (the volume of transactions).

Portfolio performance. We proxy portfolio performance as an average of the buyer's evaluations of projects performed by suppliers *(Average satisfaction rating)*. This is similar to previous studies that operationalize relationship performance as the buyer's overall evaluation of the supplier's performance (Jap, 2007; Kumar, Stern, & Achrol, 1992). Data on project evaluation is readily available from the marketplace in the form of a rating the buyer assigns to the supplier after a project has been accomplished. The second, nuanced measure, *Satisfaction with the preferred supplier divided by average satisfaction,* serves to compare the buyer's relative satisfaction with the preferred supplier across clusters.

Table 4-6 in the Appendix summarizes the variables that operationalize taxonomy dimensions.

4.4. Analysis

Cluster analysis consists of two stages – identification of the number of clusters and clustering observations in the sample. While there is normally little uncertainty with regard to the second stage, the first one can be realized in a variety of ways. In the present study we chose to apply rather simple and elegant solution suggested in (Bapna et al., 2004).

First, we applied the K-means clustering method to find a number of different cluster solutions for our dataset. This method clusters objects into k partitions based on their attributes. The method assumes that the attributes form a vector space and aims to minimize the total within-cluster variance. It is commonly used in IS and marketing studies as a part of the procedure to develop taxonomies of actors, e.g. bidders (Bapna et al., 2004) or buyers (Cannon & Perreault Jr, 1999).

Second, as advised by (Bapna et al., 2004), for each cluster solution we calculated average distance from points in a cluster to the relevant cluster centre (intra-cluster distance) and minimum distance between cluster centers among all clusters (intercluster distance). Better cluster solutions have smaller intra-cluster distances (the clusters are more homogeneous) and larger intercluster distances (the clusters are situated more apart from each other). Then, we established the optimal solution by dividing the intercluster difference of a cluster by intra-cluster difference of the same cluster, which produces the dissimilarity ratio (Bapna et al., 2004), and by comparing them. The optimal cluster should have the highest dissimilarity ratio. According to the results in Table 4-3, the best solution is the one with five clusters containing 38, 4, 14, 42 and 6 portfolios respectively. However, taking into account the small size of some of the

clusters, which puts into question their value for theoretical analysis[27], as well as the similarity between the 4 and 5 cluster solutions, we chose to focus further analysis on the 4-cluster solution. Table 4-3 provides details of the 4-cluster solution.

Based on cluster characteristics, i.e. the means of the variables used for clustering as presented in Table 4-4, we came up with the following names for the buyers in these clusters: *Transactional buyers, Recurrent buyers, Small diversifiers,* and *Large diversifiers*. In assigning the labels, we relied on our interpretation of how buyers prefer to organise their supplier relationships in different portfolio clusters and how they use different exchange mechanisms.

Table 4-2. Dissimilarity ratios of different cluster solutions

Number of clusters in a solution	2	3	4	5	6	7	8	9	10
Dissimilarity ratio	1.358	1.489	**1.510**	**1.646**	1.484	1.418	1.419	**1.564**	1.351

Figure 4-2 provides an illustration of the four types of buyer portfolios. The central node of each portfolio represents the buyer. The buyer is connected to other nodes, the suppliers. The connecting lines are either continuous or dotted, which means that respectively reverse auctions or negotiations dominate as an exchange mechanism. Thus, for example, most lines of Transactional buyers are continuous, while the lines of the relational suppliers are dotted. The size of the buyer nodes illustrates the monetary turnover of the portfolios. The dark colour of one of the supplier nodes denotes the preferred supplier. The size of the preferred supplier node relative to other supplier nodes in the same portfolio indicates an approximate proportion of business allocated to the preferred supplier. Thus, the size of preferred supplier node in the Recurrent portfolio is larger relative to other suppliers than in other portfolios.

Cluster 1. *Transactional buyers*. We label the first portfolio cluster "*Transactional buyers*", because the patterns of behaviour displayed in this portfolio are similar to arms-length, market-driven exchange relationships. Most projects in this portfolio are procured via open reverse auctions (70%). Transactional buyers allocate few projects with a single preferred supplier, 32%, which is the lowest level among all clusters, and also have the shortest duration of relationships with preferred supplier, 241 days. It is interesting to note that while the average project value here is the smallest among all clusters (USD 397), the projects take longer to accomplish (48 days) than more expensive projects of Recurrent buyers (USD 504 and 30 days respectively). A possible explanation is that it takes longer for Transactional buyers to set up a sound communication and coordination with new, unfamiliar suppliers.

[27] The same argument applies to the 9 cluster solution, which is the second-best.

Cluster 2. *Recurrent buyers*. The label "*Recurrent buyers*" is used because buyers in this cluster assign high importance to preferred suppliers, with whom they have exchange relationships for a relatively long period of time. A key factor distinguishing *Recurrent buyers* from the other three clusters is the allocation of a higher share of projects (78%) to their preferred supplier. The duration of relationships with the preferred supplier is two times longer than that of *Transactional buyers*. These buyers use open reverse auctions the least of all four types (16% of projects); by contrast, in 84% of cases they use negotiations. Their project value (USD 504) is higher than that of *Transactional buyers*, which might be due not only to the project size and complexity but also to the fact that *Transactional buyers* pay lower prices as a result of competitive bidding at reverse auctions. This difference, however, is not statistically significant.

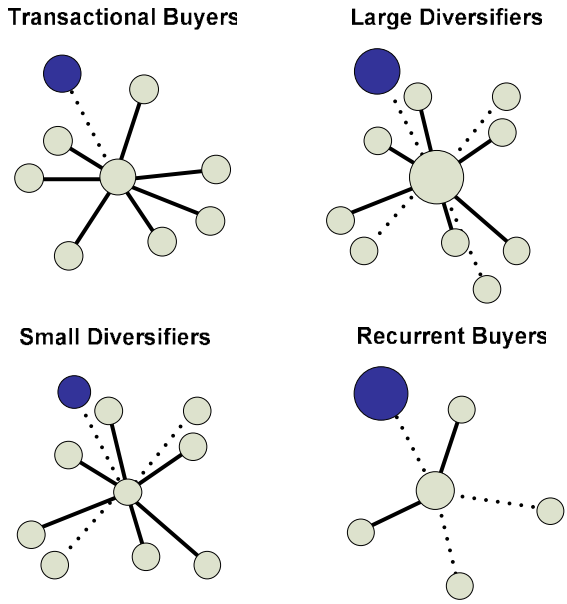

Figure 4-2. Clusters of buyers' portfolios of exchange relationships

Clusters 3 and 4. *Small diversifiers* and *Large diversifiers*. The two remaining clusters exhibit more similarities than differences, therefore we analyze them together. Buyers in these clusters do not demonstrate preferences for one or many suppliers or for exchange mechanisms to the extent that *Transactional and Recurrent buyers* do. Here, buyers use negotiations somewhat more often than auctions, which are used in 46% and 33% of cases respectively. Similarly, they favor single preferred suppliers (allocating to them 63% and 56% of projects), although to a lower extent than *Recurrent buyers*.

Therefore, we label these clusters "diversifiers". The duration of their relationships with the preferred supplier is equally long – 873 and 806 days respectively. The differences between *Small and Large diversifiers* lie in the size of the portfolio, in which *Large diversifiers* are far ahead of any other cluster (USD 35,888), and the project length. With regard to the latter, *Small diversifiers* have the lead with 105 days, which is almost two times longer than the project length of *Large diversifiers*, whose project value is over three times higher. A possible reason for this is that these are smaller firms or individuals lacking project management skills.

In summary, the analysis of the four resulting clusters of buyer portfolios of exchange relationships showed considerable heterogeneity among buyers in terms of the three taxonomy dimensions – exchange relationships, allocation mechanism and transaction characteristics. *Transactional* and *Recurrent buyers* demonstrate a completely different approach towards arranging their portfolios of relationships. *Transactional buyers* display characteristics of arms-length exchange relationships. Even the preferred supplier has little weight in their portfolio because of the low portion of projects it receives and the short duration of relationships. These buyers allocate projects mostly on a competitive basis, via reverse auctions. *Recurrent buyers* show a pattern of much closer exchange relationships, as they allocate a much higher proportion of their business to preferred suppliers via non-competitive negotiations; their exchange relationship duration is also longer. Two other portfolio clusters are somewhere in-between the first clusters in terms of the preferences for preferred supplier and allocation mechanism use.

Table 4-3. 4-cluster solution

	Transactional buyers	Recurrent buyers	Small diversifiers	Large diversifiers	Scheffe diff. p<0.1
Share of projects per preferred supplier, %	32	78	63	56	(1; 2,3,4) (2; 1,4)
Duration of relationships with preferred supplier	241	575	873	806	(1; 2,3,4) (2; 1,3,4) (3; 1,2)
Share of reverse auctions, %	70	16	46	33	(1; 2,3,4) (2; 1,3) (3; 1,2)
Portfolio size (USD)	7,884	9,692	6,223	35,888	(4; 1,2,3)
Average project value (USD)	397	504	379	1,579	(4; 1,2,3)
Average project length (days)	48	30	105	66	(1; 3) (2; 3,4) (3; 1,2,4)
N	45	39	11	9	

The variation in transaction characteristics does not seem to explain the difference in the way buyers organise exchange relationships in their portfolios. First, the proxies for project size and complexity (project value and duration) are not significantly different for *Recurrent* and *Transactional buyers*, whose ways of organising exchange relationships are drastically different. Second, the clusters of *Small* and *Large diversifiers* have quite different transaction characteristics (the differences in project value and duration are significant), while their relationships patterns are strikingly similar – there are no significant differences in terms of transaction mechanism use, use of preferred supplier or duration of relationships with the preferred supplier. In other words, transaction characteristics appear to be unrelated to the configuration of buyer-supplier relationships.

The next step in the analysis is to identify the links between clusters and their antecedents and portfolio performance. We conduct a Scheffe test for the significance of the pairwise differences between the means of the variables that underlie the antecedents and outcomes (see Table 4-4, last column). The Scheffe test is a procedure recommended for use in the case of unequal group sizes. With regard to *Number of awarded auctions/ Number of posted projects,* there are significant differences between Transactional and Recurrent buyers as well as between *Recurrent buyers* and *Small diversifiers*. No differences in the *Number of awarded projects* are significant. *Large diversifiers* are significantly different from all other clusters in *Overall spend*. Finally, *Transactional* and *Recurrent buyers* are significantly different with regard to the *Duration of presence in the marketplace, Average satisfaction* and *Satisfaction with preferred supplier*. Below we discuss these results and their implications in more detail.

Buyer opportunism. The analysis shows a significant difference in project award rate between *Transactional buyers* and *Recurrent buyers* as well as between *Small diversifiers* and *Recurrent buyers*. For *Transactional buyers* and *Small diversifiers* the award rate is significantly lower than for *Recurrent buyers*. This result cannot be explained by transaction characteristics such as project size or uncodifiability (as all projects come from a rather homogenous service category), unless we assume that non-awarded projects have characteristics quite different from the awarded ones. One plausible explanation of the difference in the award rate, in line with (Radkevitch et al., 2006a), is that *Transactional buyers* and *Small diversifiers* are more opportunistic than *Recurrent buyers* and have a tendency to post projects without an intention to award them to suppliers. Instead, these buyers might use the marketplace for price benchmarking or for obtaining free advice from suppliers (Radkevitch et al., 2006a; Snir & Hitt, 2003). An alternative explanation, in line with (Carr, 2003; Snir & Hitt, 2003), would be that some buyers bear consistently higher costs when evaluating suppliers and their offers, and therefore sometimes fail to allocate their projects when evaluation costs become prohibitively high. This does not seem unlikely, as evaluation costs are definitely higher in auctions (which *Transactional buyers* and *Small diversifiers* use more intensively than *Recurrent buyers*) than in negotiations. An implication of this explanation would be

that as a construct in our model, evaluation costs would be an outcome of cluster configuration, rather than its antecedent. Although the data in our dataset does not for any discrimination between these two explanations, both of them increase the validity of our taxonomy by providing a theoretical explanation for the differences between the portfolio clusters.

Table 4-4. Antecedents and outcomes of cluster variables

	Transactional buyers Mean (st. dev)	Recurrent buyers Mean (st. dev)	Small diversifiers Mean (st. dev)	Large diversifiers Mean (st. dev)	Scheffe diff. p<0.1
Number of awarded auctions/ Number of posted projects	0.7673 (0.1531)	0.8718 (0.1677)	0.7682 (0.1342)	0.8589 (0.2011)	(1;2) (2;3)
Number of awarded projects	73.62 (47.18)	62.56 (43.99)	48.00 (21.09)	97.11 (62.37)	NS
Overall spend, USD	27,538 (20,761)	34,719.44 (41,333)	16,009 (9,301)	87,670 (32,447)	(4; 1,2,3)
Duration of presence on the marketplace	1,595 (540)	1,330 (444)	1,599 (376)	1,683 (317)	(1; 2)
Average satisfaction	4.7755 (0.2917)	4.97 (0.0561)	4.8572 (0.2140)	4.8932 (0.1406)	(1; 2)
Ratio: satisfaction with preferred supplier / average satisfaction	1.0468 (0.0664)	1.0058 (0.0121)	1.0311 (0.0478)	1.0078 (0.0222)	(1; 2)
N (listwise)	45	39	11	9	

Buyer experience. The only significant difference between *Transactional* and *Recurrent buyers* in terms of experience is the duration of their presence in the market, 1,595 vs 1,330 days. It is not quite plausible that Relational buyers convert into Transactional buyers after they spend more time at the marketplace. Therefore, we can conclude that experience cannot reasonably explain the observed heterogeneity in the portfolios of exchange relationships.

Portfolio performance. Recurrent buyers enjoy higher performance than Transactional buyers (both variables that operationalize portfolio performance, Average satisfaction and Satisfaction with the preferred supplier divided by average satisfaction, are significantly different)[28]. This result is in line with the extant literature in that close

[28] The small size of the difference in the level of satisfaction between the clusters may be due to the fact that in online markets for IT service suppliers performance ranking is used by buyers mostly to

buyer-supplier relationships and a high level of relational attributes (such as trust) lead to higher performance (Griffith et al., 2006; Poppo & Zenger, 2002). It is also interesting that the level of performance according to both measures is the highest for Recurrent buyers across all clusters, while for Transactional buyers it is the lowest.

In summary, the results of this analysis enhance the validity of our taxonomy of buyer portfolios of exchange relationships by identifying theoretically sound differences between different clusters of portfolios.

So far, the analysis of the taxonomy has avoided any discussion of the mechanisms that underlie close exchange relationships adopted by *Recurrent buyers* and, to a lesser extent, by *Small* and *Large diversifiers*. In other words, we have focused more on the form of relationships, rather than on their contents. In the next sub-section we provide some qualitative evidence on the contents of close relationships.

Qualitative evidence of non-contractible elements

Previous studies have described the contents of close exchange relationships as displaying the properties of cooperation and coordination (Clemons et al., 1993), trust and relational norms (Ganesan, 1994; Heide & John, 1992; Poppo & Zenger, 2002), as well as other non-contractible attributes such as quality, responsiveness, information sharing, and innovation (Bakos & Brynjolfsson, 1993a; Bakos & Brynjolfsson, 1993b), or. As discussed above, the online marketplace we study provides a favourable environment for the emergence of non-contractible exchange attributes to manifest themselves, as supplier quality can be hard to determine *ex ante*, IT services are idiosyncratic, and there is potential for economies based on learning. Although it was not possible to systematically collect evidence on non-contractible attributes of exchange, we were able to find some anecdotal evidence relating to this. We studied comments that *Recurrent buyers* in our sample had left for projects accomplished by their incumbent suppliers. After screening the feedback of several *Recurrent buyers* we identified a number of quotes, in which buyers refer to one of the five non-contractible attributes. These quotes are not unique but rather typical for the feedback Relational buyers give to their suppliers on this online marketplace.

The qualitative evidence of the presence of the non-contractible exchange attributes is presented in Table 4-7. We argue that these quotes provide support (although anecdotal) for the intuition that at least in some cases recurrent transactions between buyers and incumbent suppliers are motivated by suppliers' investments in non-contractible attributes (quality, responsiveness, information sharing, trust and innovation). This result is in line with Bakos and Brynjolfsson (1993), according to whom a supplier will be willing to invest in non-contractible attributes only if it expects to be able to appropriate a share of the created value. In the case of the online marketplace

reward or punish suppliers for good or bad performance respectively, rather than to objectively rank the performance. Over 90% of ranked projects have the highest possible rating.

of IT services such value comes in the form of new business from the same buyer awarded on a non-competitive basis, i.e. via negotiations rather than online reverse auctions.

In the next section we discuss the theoretical implications of the developed taxonomy and its research limitations.

4.5. Discussion

There are four clusters of exchange relationships portfolios identified as a result of the taxonomy development – *Transactional buyers, Recurrent buyers, Small diversifiers* and *Large diversifiers*. In these portfolios buyers employ distinct ways of organising exchange relationships with their suppliers. Clearly, the picture we observe in practice is different from the predictions of the literature (Bakos & Brynjolfsson, 1993a; Bakos & Brynjolfsson, 1993b; Clemons et al., 1993): we find not only portfolios based on close buyer-supplier relationships, but also portfolios of arms-length relationships, as well as mixed portfolios. In other words, within a single setting, we observe several forms of organising buyer-supplier relationships.

The observed forms of exchange relationships, however, have much in common with a number of theoretical types, described in the literature.

Transactional buyers' style of organising their exchange relationships corresponds to market governance as described in the transaction costs literature. This form of exchange is applied to non-specific transactions and is subject to governance by classical contracts, where all contract contingencies can be explicitly specified (Williamson, 1991). Parties to this type of exchange have a strong incentive to perform, rooted in the availability of market substitutes to the supplier and the buyer's ability to quickly switch from one supplier to another. This type of exchange is of short-term nature and is characterized by intensive bargaining and competition.

The pattern displayed by *Recurrent buyers* has properties similar to the recurrent contracting transactions discussed in Ring and van de Ven (1992). Recurrent contracting is contingent on prior performance, contains emerging elements of non-contractible exchange attributes such as trust, and is subject to neo-classical contract governance (Ring & Van de Ven, 1992).

From the perspective of recurrent exchange, it is likely that the small proportion of reverse auctions that is present in the portfolio of *Recurrent buyers* serves them early in each transaction's trajectory to identify suppliers with whom to build closer exchange relationships in further recurrent projects. As supplier quality becomes known after the first projects, the buyer switches to non-competitive bilateral negotiations to allocate further projects. This is in line with emerging business practices, where online reverse auctions are used to allocate long-term, rather than for discrete, one-off transactions (Jap, 2003). Further, as relationships develop and the level of non-contractible

attributes in the exchange becomes high, buyers become unwilling to jeopardize their relationships with the incumbents by requesting them to participate in auctions too often (Elmaghraby, 2007).

To summarize our intuition, while transactional buyers use reverse auctions for project allocation on the basis of price, supplier rating and other directly observable attributes, recurrent buyers mostly use reverse auctions as a screening instrument, substituted by non-competitive negotiations at a later stage. This intuition is in line with studies that have reported that reverse auctions can be used for supplier screening and allocation of long-term contracts (Elmaghraby, 2007; Jap, 2003).

Finally, *Small* and *Large diversifiers* demonstrate properties somewhat close to those described by Holland and Lockett in their empirical investigation of mixed mode networks. In mixed mode networks, buyers tend to have close relationships with some firms and arms-length relationships with the others (Holland & Lockett, 1997). Similarly, in our setting buyers seem to use different exchange mechanisms for different exchange relationships.

This finding also implies that studies that focus solely on a dyadic view of exchange relationships (as is common in the literature, e.g. (Ring & Van de Ven, 1994)), may paint a limited picture of a firm's exchange relationships. The few existing studies at the portfolio level, e.g. (Johnson & Selnes, 2004) and (Goerzen & Beamish, 2005), suggest that dyadic relationships make more sense when considered in the context of a relationships portfolio.

It is not untypical that outcomes of a taxonomy development process cannot be easily explained by existing theories: for example, see (Cannon & Perreault Jr, 1999; Zhong & Wu, 2006). The key finding of the present study is that the existing theory does not help to explain how the diversity of buyers' portfolios of exchange relationships observed in our analysis can emerge in an environment characterized by rather homogenous services and where transaction attributes have no statistically significant effect on the portfolio configurations. An important direction for further research, which could help gain insights into the sources of the heterogeneity, would be the evolution of portfolios of exchange relationships over time. Another interesting direction for further research would be testing the generalisability of the presented findings across other online marketplaces and industries as well as across firms of larger size.

The present study comes with a number of limitations. First, the nature of the online marketplace did not provide an opportunity to collect systematic data on non-contractible attributes of exchange relationships, which introduced some speculative flavour to our discussion and conclusions. Second, the portfolios were analyzed in an aggregated fashion, as a whole, despite the fact that projects in these portfolios are often conducted years apart. This might result in a somewhat blurred picture of otherwise dynamic and evolving exchange relationships. Third, in this study we focus only on online exchange relationships, although these might provide an incomplete

picture of buyers' exchange activities: future studies should extend the scope by gathering and analyzing data on offline exchange relationships along with online relationships.

4.6. Conclusions

We conducted an exploratory investigation of empirical configurations of buyer-supplier exchange relationships on an online marketplace for IT services and the accompanying use of online reverse auctions. We used buyers' portfolios of supplier relationships as a unit of analysis and employed a clustering technique to develop a taxonomy of portfolios of buyer-supplier relationships. Further, we analyzed connections between clusters of buyers' portfolios and cluster antecedents and outcomes.

There are several key findings in the present study. First, the resulting taxonomy of exchange relationships revealed considerable heterogeneity of buyer-supplier exchange relationships in an online marketplace for IT services. This heterogeneity cannot be explained by the variation in transaction attributes. Four clusters of portfolios of exchange relationships were identified – Transactional buyers, Recurrent buyers, Small diversifiers and Large diversifiers – that possess distinct mixes of exchange relationships, exchange mechanisms and transaction characteristics. Transactional buyers prefer arms-length relationships and tend to switch suppliers often, while Recurrent buyers develop longer and closer exchange relationships with incumbent suppliers. We also found some qualitative evidence on the existence of non-contractible exchange attributes in the Recurrent portfolios. The two other clusters, Small and Large Diversifiers, do not show such strong preferences either for arms-length or for recurrent exchange or for any exchange mechanism. Buyers in these clusters seem to combine arms-length relationships with some suppliers and recurrent relationships with other suppliers.

The high level of buyer experience across different portfolios indicates that they are not simply intermediary stages of the evolution of one single portfolio type but rather deliberate stances defined by an inherent intention of different buyers to pursue specific exchange relationship strategies. Furthermore, quite in line with the literature on inter-organisational relationships, Recurrent buyers were found to enjoy higher performance of their portfolios than buyers in other clusters, while Transactional buyers have the lowest level of performance.

Second, reverse auctions are found to be associated with short-term, arms-length exchange relationships, while bilateral negotiations support longer-term, recurrent exchange relationships that display non-contractible elements of exchange. On one hand, this supports some of the existing studies on reverse auctions that have reached similar conclusions (Emiliani & Stec, 2002; Van Tulder & Mol, 2002). On the other hand, our findings do not contradict studies that consider online reverse auctions to be appropriate for supplier screening and initiating long-term exchange (Elmaghraby,

2007). It is likely that reverse auctions can be used by Recurrent buyers to initiate recurrent relationships with preferred suppliers.

Third, the presence of a large cluster of Recurrent buyers can have far-reaching consequences for the online marketplaces. As the reliance on non-contractible elements of exchange is increasing, recurrent relationships can gradually evolve into even closer form of exchange such as relational contracting (Ring & Van de Ven, 1992). For an online marketplace such as the one investigated in this study, that would mean that buyers in relational dyads would experience less need for the mechanisms of formal governance (e.g. formal terms and conditions, arbitration, rating systems) and at some point might choose to abandon the marketplace to avoid service fees. To prevent relational dyads from leaving, online marketplaces need to cater for close buyer-supplier relationships. They must address the key characteristics of such relationships, such as their longer-term nature, intensive information exchange and accumulation, and re-use of knowledge. One way to address such issues would be via providing more value-added, collaboration-oriented functionality to support project execution, learning, information exchange and communication between long-term partners.

Appendix Chapter 4

Table 4-5. Two-tailed correlations (Pearson's)

	1	2	3	4	5	6	7	8	9	10	11
1. Share of projects per preferred supplier (%)											
2. Duration of relationships with the preferred supplier (days)	.577**										
3. Share of projects procured via open reverse auctions (%)	-.683**	-.470**									
4. Portfolio size (USD)	-.059	.297**	-.225*								
5. Average project value (USD)	.070	.276**	-.168	.736**							
6. Average project length (days)	-.117	.136	.113	.121	.177						
7. Number of awarded projects divided by number of posted projects	.230*	.113	-.285**	.165	.080	-.110					
8. Overall number of awarded projects	-.310**	-.106	.026	.419**	.043	.099	.175				
9. Overall spend	-.129	.043	-.124	.696**	.452**	.039	.239*	.677**			
10. Duration of the presence in the marketplace (days)	-.293**	-.027	.284**	-.001	-.005	.117	-.251*	.107	-.031		
11. Average satisfaction rating	.393**	.258**	-.384**	.083	.040	-.233*	.196*	.014	-.089	-.104	
12. Ratio: satisfaction with preferred supplier / average satisfaction	-.398**	-.269**	.400**	-.129	-.160	.190	-.156	.010	-.111	.133	-.941**

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

Table 4-6. Cluster dimensions, antecedents, outcomes, underlying variables, measurements

Taxon. dimensions	Variables	Measurements
Buyer-supplier exchange relationships	Share of projects per preferred supplier (%)	First, a supplier with the higher number of projects is identified in buyer's portfolio. Second, share of this supplier's projects in the portfolio is calculated
	Duration of relationships with preferred supplier (days)	Calculated as a difference between the starting dates of the last and the first projects with the preferred supplier
Exchange mechanism		
	Share of projects procured via open reverse auctions (%)	Calculation is straightforward
Transaction characteristics		
	Portfolio size (USD)	Monetary volume of all projects in a portfolio
	Average project value (USD)	Average of project values in a portfolio. Project value is operationalized as the price paid by the buyer to the supplier
	Average project length (days)	Difference between the date when buyer's feedback for the project is assigned and the auction end date. The feedback is normally supplied right at the end of a project
Cluster antecedents		
Buyer opportunism		
	Number of awarded projects divided by number of posted projects	Calculation is straightforward
Buyer experience		
	Overall spend (USD)	Monetary volume of all projects awarded by the buyer in the marketplace
	Overall number of awarded projects	Calculation is straightforward
	Duration of the presence in the marketplace (days)	Difference between the date of data collection and the date of buyer's registration on the marketplace
Portfolio performance		
	Average satisfaction rating	Rating available on the marketplace
	Ratio: satisfaction with preferred supplier / average satisfaction	Calculation is straightforward

Table 4-7. Qualitative evidence of non-contractible exchange attributes on the online marketplace for IT services

Attribute	Qualitative evidence
Quality	"A very complex project, multiple flash applications, complex photoshop work, many complex html pages and custom programming. All done on time, within budget. I have now done more than 10 projects with triguns and they are becoming increasingly complex so that must speak for itself" [nippi]
	"Once again, the team at Onix Systems have excelled themselves. What was an excellent site already, has now been added to and with its improved functionality, now becomes one of the premier sites of its class. Well done team, long may our relationship continue." [auctionpix]
Innovativeness	"This project is another perfect example of where the WINIT team was able to go above and beyond by providing not only the solution I was looking for, but also identifying problems with the original scope and coming up with creative solutions to address them that resulted in a much better end result. I have used this team for three years now and I'm very pleased to be able to WIN with WINIT" [gopro]
Responsiveness	"Sonic Web Graphics did a first rate job designing and coding our project. They were very responsive to comments and turn around work with impressive speed. We will continue to use them extensively." [clandesm]
	"This was a very difficult project with an extremely difficult client. Client demanded large changes mid-project. Triguns was able to handle these changes with good grace and speed. Another job well done." [nippi]
Information exchange	"I relied heavily on the WinIT team on this project as it was our first .NET application. As always, WinIT offered suggestions and pointed out potential hurdles to me well in advance, before the issues had a chance to compromise project timelines and budget. WinIT is a valued business partner and they work very hard to foster the long-term relationship and joint success that we are both experiencing. Cheers!" [gopro]
Trust	"Excellent service and skill. This project turned out perfectly. Quick turnaround and great price. Would highly recommend for any project size. Very professional and dependable provider. Thanks again!!!." [lilesa]
	"This project originally had a very tight deadline and I knew I could count on WinIT to do whatever was necessary to deliver the project on time... I have worked with this team for over a year now and I really consider them to be my "virtual" production department. If you're contemplating using them for the first time, just do it. You'll be glad you did! Thanks!" [gopro]

Chapter 5. The Impact of Reverse Auctions on the Execution of a Construction Services Project

When you start a job you always think -- how the hell are we going to finish this? But every job is finished…

Bobby, Project Manager of InCo

5.1. Introduction[29]

A recent survey found that as many as 60% of industrial buyers do not use online reverse auctions (SupplyManagement.com, 2007). As one of the main reasons for not using reverse auctions, buyers indicated the fear that auctions can harm relationships with their suppliers. Such an attitude is not rare in the buyers' community where reverse auctions are concerned. Due to their economic impact, online reverse auctions are often seen as a double-edged sword. On the one hand, they optimize the procurement process, stimulate competition among suppliers (Carter et al., 2004; Jap, 2003) and result in lower prices for buyers (Jap, 2002). On the other hand, online reverse auctions can not only make suppliers concerned about the buyer's opportunistic behaviour (Jap, 2003) but, arguably, also produce disruptive effects on buyer-supplier relationships (Emiliani, 2004).

Most previous empirical studies that have looked at the "relational" aspect of online reverse auctions addressed the immediate effects of reverse auctions on buyer-supplier relationships (Gattiker et al., 2007; Jap, 2003; Jap, 2007). By contrast, the effect of auctions on buyers-supplier relationships that form and develop during the contract execution phase has not really been the subject of any detailed examination. The importance of filling this gap stems from the well-known fact that relationships between contractual parties positively affect business performance (Kalwani & Narayandas, 1995; Uzzi, 1997; Valsamakis & Groves, 1998). Whether reverse auctions improve such relationships, damage them, or bring about some previously unknown

[29] I would like to thank Wouter Vermeer, a master student at Erasmus University Rotterdam School of Management, for helping with collecting and processing data for this research project.

developments, is an issue of considerable academic and managerial importance (Jap, 2007; Pearcy & Giunipero, 2006).

In this study we adopt a focus on employees involved in the execution of the auctioned contracts on a day-to-day basis in the role of project managers. Project managers are likely to be primarily affected by the outcomes of reverse auctions, as first they have to deal with the contract terms (e.g. price) established as a result of the auctions, and second they perform what is called in the literature a 'boundary spanning function', i.e. they represent their organisations in their contacts with the outside world (Aldrich & Herker, 1977). Boundary spanners control outbound and inbound information and affect the development and quality of relationships with the outside organisations (Perrone, Zaheer, & McEvily, 2003; Weitz & Jap, 1995), leadership (Fleming & Waguespack, 2007), information transfer between the focal organisation and the outside world (Tushman & Scanlan, 1981), and the ability of organisations to cope with the environmental constraints (Aldrich & Herker, 1977). Being exposed to influences from both the inside and outside of their organisations, boundary spanners are susceptible to role pressures that arise due to conflicting expectations and demands. To the extent that the reverse auctions' outcomes can be related to these conflicting demands and expectations, they are likely to affect boundary spanners' performances and relationships with the other parties.

Our investigation is set in the context of the building construction industry, where reverse auctions are picking up (Beall et al., 2003) and where projects are complex, lengthy and are subject to numerous risks and contingencies (Söderholm, 2007). In such situations, the skills of the individuals in boundary spanning roles are important. While a number of the skills successful construction project managers should possess have been previously identified, including interpersonal skills, negotiation skills, and leadership (Gardiner & Simmons, 1998), neither the boundary spanning nor project management literatures provide sufficient insight into the functioning of the competences that help such individuals resist the role constraints, manage contingencies and maintain productive relationships with other parties. Therefore, this study attempts to answer the following research questions:

> *How do reverse auction outcomes affect the execution phase of auctioned contracts? What are the key relational competences of the boundary spanning individuals that influence the effect of the reverse auctions on inter-organisational relationships and project performance?*

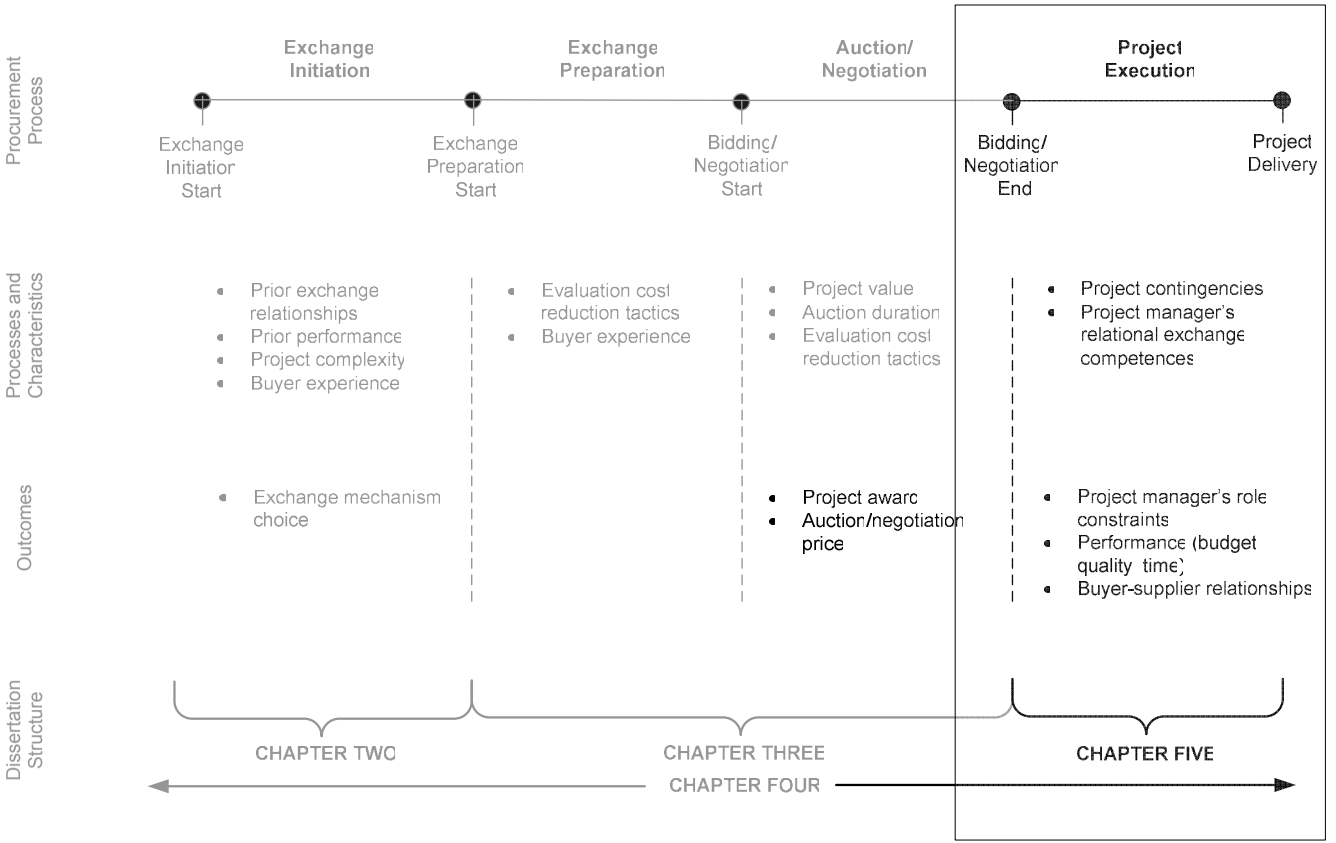

Figure 5-1. Chapter 5 in the context of the sourcing process.

In order to answer the research questions we conduct a longitudinal case study into a renovation and redesign project of a public building in Amsterdam in the period September 2005 - October 2006. One key finding of this investigation is that the impact of online reverse auctions at the project execution stage is primarily in terms of aggravating the role constraints of the project managers from the contractors' side. The role constraints are found to negatively affect inter-organisational relationships and project performance. Another key finding consists in an inductive identification of three relational competences that enable project managers to mitigate the effect of the role constraints: benevolent gaming, reciprocity, and proactiveness.

Figure 5-1 highlights the place of Chapter 5 in the context of the other studies of this dissertation. From the perspective of the dissertation structure and sequence, Chapter 5 takes the investigation further from where it was left by Chapter 3, which treated auction outcome as a dependent variable and a deeper one, compared to Chapter 4, which looked at project outcomes but did not analyse the project execution stage.

The chapter is organised as follows. First, we present a literature review on the effect of auctions on the inter-organisational relationships and on the boundary spanning and construction project managers' skills. This is followed by a section introducing a research framework and another section explaining the methodology and describing the case. The chapter continues with an analysis of the effect of reverse auction outcomes on the boundary spanners' role pressures. Next, we discuss the relational exchange competences of project managers and elaborate on how these can mitigate the effect of the role constraints. The chapter ends with a discussion and conclusions.

5.2. Literature

5.2.1. Buyer-supplier relationships

Inter-organisational relationships are of paramount importance in a wide range of exchange settings due to their positive effect on fundamental business outcomes such as costs and performance (Kalwani & Narayandas, 1995; Noordewier, John, & Nevin, 1990). Full-blown inter-organisational relationships take time to develop, as they are rooted in the number and frequency of interactions between exchange parties, draw on the common exchange history and involve expectations of future business (Dwyer, Schurr, & Oh, 1987; Wilson, 1995).

Buyer-supplier relationships have been a central issue in the literature on online reverse auctions in the domains of marketing, procurement, supply chain management and information systems research. The focus of discussion has been on the effects which reverse auctions exert on relationships between buying and supplying firms and the fit between long-term, cooperative inter-organisational relationships and the use of reverse auctions.

In a number of early studies into the link between inter-organisational relationships and reverse auctions, authors have argued that reverse auctions endanger or even destroy buyer-supplier relationships (Bartezzaghi & Ronchi, 2003), by compromising non-financial priorities such as quality (Nair, 2005), amplifying the bargaining power exerted on suppliers, signalling an orientation towards short-term financial gains (Emiliani & Stec, 2002), making suppliers suspicious of the buyer's opportunistic intentions (Tassabehji et al., 2006) and thus making them willing to retaliate (Dani et al., 2005; Emiliani, 2004). The procurement of commoditized direct and indirect inputs that are associated with arm's-length, market relationships has been viewed as the primary appropriate area for the use of reverse auctions (Sawhney, 2003; Van Tulder & Mol, 2002).

Other researchers have been more optimistic with regard to the use of reverse auctions and their effect on buyer-supplier relationships. They have argued that reverse auctions can serve for supplier screening and as a "wake-up call" to existing suppliers (Jap, 2002), as a basis for the development and maintenance of long-term relationships (James, 2003), and can be associated with the elements of relational exchange such as long-term contracts (Pearcy & Giunipero, 2006), supplier cooperation (Pearcy et al., 2007; Smart & Harrison, 2003) and high levels of trust and quality (Radkevitch & van der Valk, 2005). Within online markets, reverse auctions can be used along with (rather than in place of) long term relationships as an element of spot and futures markets to hedge risks (Grey, Olavson, & Shi, 2005), as well as within long-term relationships that are characterized by high non-contractibility, asset specificity and complexity of description (Wang & Archer, 2004).

In addition, a number of enhancements and improvements have been suggested to make reverse auctions more relationship-friendly. These enhancements include using auctions as a part of a hybrid allocation mechanism to grant preferential terms to incumbent suppliers (Engelbrecht-Wiggans & Katok, 2006), using multi-dimensional scoring rules accounting for non-price attributes (Koppius, 2002), subsidising idiosyncratic investments, conducting post-auction negotiations and making payments to losing bidders (Daly & Nath, 2005).

Recent contributions have come from several nuanced studies exploring these effects of reverse auctions on aspects of inter-organisational relationships based on datasets of auction transactions and/or (quasi-) experiments. In the context of the automotive industry the use of descending auctions has been found to lead to higher levels of suspicion among suppliers of opportunism by buyers than in the use of sealed bid auctions: this applies to both new and incumbent suppliers (Jap, 2003). Interestingly, at the same time incumbent suppliers have been found to increase their willingness to make idiosyncratic investments after the auctions (Jap, 2003). A quasi-experimental study in four industries further explored the effect of auctions on relational attributes (Jap, 2007). The number of bidders in auctions increases suppliers' suspicions of opportunism, while the increase of the contract volume leads to a higher supplier satisfaction and continuity expectations. Having around 6-7 lots in an auction leads to a

decrease of opportunism suspicions and increases continuity expectations. Finally, using an auction-award rule in combination with a fully visible price also raises suspicions of opportunism, as price visibility seems to enhance competition focus on price at the expense of non-price attributes, such as quality and relationships (Jap, 2007).

Another study looked at the effect of buyer-supplier relationships before an auction on the supplier's bidding aggressiveness, and the effect of this aggressiveness on the relationships after the auctions (Jap & Haruvy, 2007). In a survey of suppliers bidding in 12 online reverse auctions, the authors found that the number of competitors' bids increases bidding aggressiveness. Incumbency, number of bidders, and the willingness to make relationship-specific investments lead to lower bidding aggressiveness. Bidding aggressiveness was found to decrease suppliers' disposition towards developing a relationship and also to decrease incumbent suppliers' satisfaction with the relationship (Jap & Haruvy, 2007).

A study into the allocation mechanism choice by the buyer on an online marketplace for IT services found that prior repeat interaction with vendors favours the use of negotiations over auctions in the subsequent transaction, while the need to explore the marketplace and dissatisfaction with a vendor's performance in the most recent project lead to the use of auctions instead of negotiations (Radkevitch, van Heck, & Koppius, 2008). Furthermore, a comparison of the use of reverse auctions and bilateral negotiations has shown that the use of reverse auctions is associated with short-term relationships while negotiations support long-term relationships. Buyers using predominantly negotiations tend to be more satisfied with their suppliers than buyers who predominantly use auctions (Radkevitch et al., 2006c). Further experimental investigation of the effects of different communication media on trust in procurement negotiations found that auctions are always lower on benevolence and honesty trust than face-to-face negotiations and lower than email in high procurement complexity situations; however, in low complexity situations auctions are equal in benevolence and honesty trust to email. Considering the effect of procurement complexity on trust, suppliers have higher trust in auctions when the level of procurement complexity is low rather than when it is high (Gattiker et al., 2007).

Finally, a recent study has shown that prior exchange has a clear value in procurement auctions. In the context of the high-tech industry, incumbent suppliers have been found to benefit from their past relationships with the buyer in comparison to new suppliers. Incumbents are three times more likely to win a contract than new suppliers and, when selected as winners, they provide buyers with fewer cost savings than new suppliers (Zhong & Wu, 2006). See the Appendix for a complete overview of empirical studies into the effect of reverse auction on buyer-supplier relationships.

Most of these empirical studies have looked at the immediate impact of online auctions on buyer-supplier relationships, rather than at the effects that reveal themselves over time (e.g. they examine the effect on the level of supplier's trust right after an auction event rather than whether such effect still persists when the supplier is working to fulfil the contract obligations). Several authors call for the exploration of more

"distant" effects of reverse auctions, such as the effects on buyer-supplier relationships over multiple auctions or in the context of long-term relationships (Jap, 2007; Wang & Archer, 2004). Pearcy et al. (2006) suggest using "in-depth case studies" for this purpose (Pearcy & Giunipero, 2006). In the present study we take the investigation into the effect of reverse auction on the inter-organisational relationships one step further by evaluating the impact of auction on boundary spanners' role constraints and the role of boundary spanners' competences in moderating the effect of role constraints on inter-organisational relationships and project performance.

In the next section we look at the literature on boundary spanners – employees who are at the forefront of inter-organisational relationships during the contract execution phase – which will later allow us to conceptualize the impact of reverse auction at the project execution stage.

5.2.2. Organisational boundary spanners

The key role in developing and maintaining inter-organisational relationships rests with the boundary spanners, i.e. employees whose activity transcends organisational boundaries *(Weitz & Jap, 1995)*. A *boundary spanner* is an organisational role that involves processing information from outside organisations, representation of the interests of the boundary spanner's own organisation in the relations with other organisations and providing links between the organisational structure and environmental elements (Fleming & Waguespack, 2007; Perrone et al., 2003: 423). A key aspect of this role is that due to their unique position boundary spanners are subject to contradicting expectations from within and outside their organisation (Kahn, Wolfe, Quinn, & Snoek, 1964). For instance, the outside party in a project can expect strong adherence to contractual terms and agreed quality level in a project, whereas the boundary spanner's superiors from the inside of the company may exert pressure to cut costs in order to achieve higher margins. These conflicting expectations create pressures on the boundary spanning roles that affect their job satisfaction and performance (Lysonski, 1985).

The literature distinguishes between two key types of boundary spanning: informational and representational (Adams, 1976; Aldrich & Herker, 1977; Tushman & Scanlan, 1981). The information roles are responsible for transmitting information and ideas between outside and inside the organisation (Fleming & Waguespack, 2007; Leifer & Huber, 1977). The representation roles are focused on activities such as sales and procurement (Tushman & Scanlan, 1981), but can also maintain or increase the political influence of an organisation and perform a mitigating function between the focal organisation and the third parties (Aldrich & Herker, 1977; Friedman & Podolny, 1992). Most of the discussion of the boundary spanners' skills to date centres on those relating to the information role.

Employees in both the informational and representational boundary spanning roles are affected by the uncertainty of the environment within which they operate (Aldrich & Herker, 1977). Defined in terms of turbulence, change and the nature of causal

relationships (Duncan, 1972), high uncertainty increases the amount of information that needs to be processed by boundary spanners and the time needed to make decisions (Boulton, Lindsay, Franklin, & Rue, 1982). Uncertainty exacerbates the role conflicts (Lysonski, 1985; Lysonski & Woodside, 1989), decreases job satisfaction and negatively affects performance (Lysonski & Woodside, 1989).

Boundary spanners in representational roles face an additional source of uncertainty and pressure in projects with a limited lifespan (e.g. short-term R&D alliances or construction projects). In such projects boundary spanners face pressure to build relationships with outside parties in a fast manner and maintain them at the level appropriate to a particular exchange situation, under conditions of "co-opetition" (Lambe, Spekman, & Hunt, 2000). There is a possibility that collaborators at one point of time can turn into competitors at another point of time. Therefore, boundary spanners should be cautious about sharing information that may later be abused by the competition; they should also have a prepared "exit strategy" for projects that are inherently short-lived (Lambe et al., 2000).

The skills of the boundary spanning individuals are a vital asset responsible for their performance. For instance, these skills affect the level of trust other organisations experience in relation to the boundary spanners (Perrone et al., 2003), the amount of information they are able to process (Dollinger, 1984; Lysonski, 1985), and the quality of inter-organisational exchange (Williams, 2002). Boundary spanners' abilities and skills are thus linked to the organisation's ability to counteract the effects of environmental challenges: "An organisation's ability to cope with environmental constraints depends in part on the ability of role incumbents to achieve a compromise between organisational policy and environmental constraints, to choose strategic moves to overcome constraints, or to create conditions in which the organisation's autonomy is seldom challenged" (Aldrich & Herker, 1977: 223). Among the characteristics of successful and efficient boundary spanners cited in the literature are flexibility, extroversion, tolerance of ambiguity, self-assurance, need for visibility and savoir faire, need for achievement, being a locus of control, leadership and independence, risk-taking, and integrative complexity (Dollinger, 1984; Williams, 2002).

Yet, to our knowledge there has been little dedicated research so far into the competences that help the boundary spanners of the representation type to overcome the environmental uncertainty and role pressures, although such competences are vital for the success of inter-organisational relationships and of work undertaken in collaboration with third parties. Since boundary spanners in representation and information roles perform different functions, the skills required for their successful performance are also likely to be different. A need for more research, in particular with regard to competences related to dealing with the outside parties, has been noted earlier: "There needs to be more specific evidence to link the use of a particular set of competences or collaborative behaviour to outcomes." (Williams, 2002: 121).

In the next subsection we briefly review the literature on a specific type of boundary spanner (project managers) in the construction industry in order to obtain more context-specific insights into their skills.

5.2.3. Uncertainty and project managers' skills in construction projects

Today organisations increasingly work together on a project basis, targeting specific challenges and exploring explicitly-defined business opportunities. Project-based inter-organisational arrangements are widespread in many areas, including building construction (Gardiner & Simmons, 1998), inter-organisational information system development (Levina, 2005), oil exploration (Våland, 2002), and the development of cutting edge high-tech products (Lambe et al., 2000). Such projects require a high level of interaction between parties and are inherently collaborative (Wilson, 1995).

In comparison with the projects in other industries, e.g. in manufacturing, projects in the construction industry are prone to a multitude of contingencies as the environment in which they are executed is less controllable (Galbraith, 1973). Almost every project in construction is unique and tailor-made, which makes project design, planning and execution crucial. The literature has identified two major sources of uncertainty in construction projects. First, due to the unique nature of the projects, estimating resources and time needed to accomplish the related work can be challenging (Missbauer & Hauber, 2006). For example, in a project that requires redesign and renovation of a historical building, the number of people and time needed to remove interior walls is hard to estimate before starting the actual work if the thickness of the walls and the characteristics of the material they are made of are not precisely known. For buildings constructed over a hundred years ago the original drawings of the building design and the specifications of the materials are not necessarily available. Second, the project environment per se is a source of contingencies, such as conflicts between the project stakeholders due to the differences in their interests and goals, to changes of project specifications by the client; and to failures of sub-contractors (Söderholm, 2007). These characteristics create challenges in construction projects, specifically for the individuals in the role of project managers (Edum-Fotwe & McCaffer, 2000; Söderholm, 2007).

In order to cope with the challenges of the projects, construction project managers need to possess a range of technical and administrative skills, which include planning, schedule control, cost estimation, quality control, performance reporting, risk identification and organisational planning (Edum-Fotwe & McCaffer, 2000). Also, due to the contingency-prone nature of construction projects as well as to the fact that construction project organisations consist of people with different and some times conflicting interests (Loosemore, 1998), skills such as leading, communicating, negotiating and problem-solving are given an especially high importance (Edum-Fotwe & McCaffer, 2000).

Several studies have investigated the approaches employed by project managers to deal with other project stakeholders and contingencies. One study identified four broad practices project managers use to handle unexpected events: innovative action, detachment strategy, intensive meeting schedules, and negotiation of project conditions (Söderholm, 2007). Another study stressed the ability to recognize and deal with the political aspects of construction projects (Pinto, 2000). Another study related a number of negotiation styles to specific negotiation outcomes in the construction industry (Cheung, Yiu, & Yeung, 2006). The authors found that such styles as obligating, dominating and avoiding are less relevant to functional outcomes. By contrast, integrating is found to be a way to achieve functional outcome, and compromising is found to help resolve disputes (Cheung et al., 2006). A number of guidelines for successful bargaining have been identified as a result of an exploratory study of four construction projects: information management, avoidance of the coercive imposition of solutions, achieving a common definition of the disputed matter, being cautious about allocating blame, being cautious about temporary coalitions, considering the structure of project teams, and being cautious about goal inflexibility (Loosemore, 1999).

Yet so far the construction management literature seems to have lacked a dedicated analysis of the relationships-related competences of project managers, specifically with regard to how differences in the levels of such competences account for the differences in the levels of relationships of project managers with the clients' side as well as in the performance of the projects. The present study aims to close this gap by conducting a longitudinal exploratory investigation of the competences employed by project managers to deal with specific challenges during the execution phase of a complex building renovation project, and relating these competences to specific relational and performance outcomes.

5.3. Theoretical Framework

5.3.1. The impact of reverse auctions on boundary spanners

Our investigation has an exploratory nature, which is a consequence of a lack of theoretical knowledge on boundary spanners' relational exchange competences and their role in the project execution stage. Yet, since some of the theoretical constructs with which the relational exchange competences are likely to interact have been established from the literature review and since we also investigate the effect of reverse auctions on boundary spanners, some elaboration on the theoretical background is possible. In this subsection we first introduce a typical setting in which construction projects take place and then elaborate on the relevant theoretical constructs.

A typical setting for a building construction project involves the client hiring an architect (often an architectural design company) who develops a specification for a build-

ing to be designed or renovated. The design phase is often carried out in collaboration with other parties, such as installation advisors or interior designers. When the design has been approved by the client, potential contractors (e.g. constructing and installations companies) are shortlisted and invited for a tender of negotiations. A bid in a tender involves submission of a sealed bid with prices for the items listed in the bill of quantities. The winner is as a rule the bidder with the lowest price. During the project execution phase, the architect usually oversees the project, representing the interests of the client. On the contractors' side the architect interacts with the construction project managers to coordinate and monitor project activities.

As outlined in the literature review, construction project managers are responsible for a variety of activities, many of which require them to span organisational boundaries. In particular, they often work at the site of the client organisation when that organisation continues to operate; they have to coordinate activities with the project managers of other companies involved in construction, e.g. installation companies; and they have to discuss the progress with the architect and implement changes to the plans and construction design, if necessary.

In order to investigate the impact of reverse auctions on the contractors' project managers during the execution stage, we consider this through the prism of the boundary spanning theory. The main reasons for focussing specifically on the contractors' side is that we expect contractors' project managers to be much more affected by the outcomes of reverse auctions (e.g. when the auction price is low) than the boundary spanners on the client's side.

The literature on boundary spanning is rooted in the role theory, according to which most of their time individuals perform distinct social roles: these roles are defined by the expectations produced by role senders, who are the individuals with whom the individual occupying a particular role interacts (Katz & Kahn, 1978). Since the activities of boundary spanners involve interaction with individuals both outside and inside their organisations, boundary spanners are subject to conflicting expectations relating to their activities from within and outside of their organisations. In the case of a construction project manager these are likely to be, on one hand, the expectations of the project owner's side that the project is going to be executed within the agreed timeline and budget and according to the quality level specified in the contract (Trigunarsyah, 2004). On the other hand, the project manager is expected to execute the project so that the company earns a profit, or to minimize losses if the project is carried out in an unfavourable economic environment.

We maintain that this contradiction between a) the need to carry out a construction project under conditions of constrained resources and time and b) the need to secure his company's margin results in the project manager's role constraints, reducing his manoeuvring space for successfully performing his work. The role constraints can be further aggravated by the environmental uncertainty that often plagues construction projects (Galbraith, 1973; Missbauer & Hauber, 2006). Unanticipated events, such as changes in the client's needs, unexpected complications at the construction site or

changes in the governmental regulations can all make it harder for a construction manger to comply with the contract terms and margin requirements, resulting in a poorer performance. Consequently, construction project manager's role constraints will make it more challenging to develop and maintain constructive inter-organisational relationships, as the economic pressure will limit his ability to negotiate with and make concessions to the other parties. We graphically display the logic of this discussion in the research framework in Figure 5-2.

At this point it is worth recalling that boundary spanners, in particular individuals occupying project management roles in the construction industry, are expected to possess a wide range of skills to cope with technical, administrative and interpersonal issues. The literature draws connections between boundary spanners' skills and the different aspects of performance (Dollinger, 1984; Lysonski, 1985; Perrone et al., 2003; Williams, 2002). In particular, it is suggested that an organisation depends on boundary spanner's skills with regard to achieving a balance between the needs of the organisation and environmental constraints (Aldrich & Herker, 1977).

As a starting point in the investigation of the construction project managers' competences? related to dealing with other project stakeholders and project contingencies, we use the concept of relational exchange competence (Day, 1995; Lambe et al., 2000). Although previously defined only at the level of organisations, relational exchange competence is identified as one of the antecedents of relational norms (flexibility, solidarity and information exchange) in inter-organisational exchange (Lambe et al., 2000). Partners who possess relational exchange competence are believed to be able to develop these relational norms more rapidly. Relational exchange competence helps "shortcut the process necessary to establish the working norms" that are needed for functional inter-organisational relationships (Lambe et al., 2000).

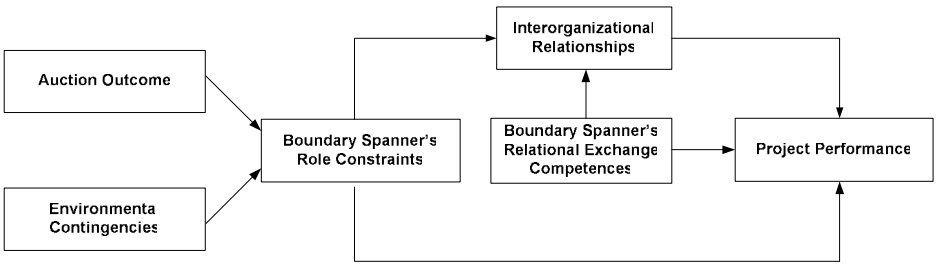

Figure 5-2. Research Framework of Chapter 5. The effect of reverse auction outcome on boundary spanners' role constraints and the role of boundary spanners' relational exchange competences in moderating the effect of role constraints on inter-organisational relationships and project performance.

However, relatively scarce details on the nature of the relational exchange competence and its mechanism are available in the literature. Day (1995) describes relational exchange competence as an organisational level capability that is based on experience and is a part of the organisation's core competence, allowing the organisation to perform ahead of the competition in managing relational exchange. This involves selecting exchange partners and negotiating with them, designing the relationships mechanics and monitoring the fit of the relationship to the changing environment (Day, 1995).

Despite the fact that the concept of the relational exchange competence is quite vaguely defined in the preceding literature, it seems to capture in general terms one important capability at the organisational level: developing and maintaining aspects of functional inter-organisational relationships such as relational norms. Therefore, we will use this concept the starting point of our inductive investigation of the competences at the level of boundary spanners. We will aim at inductively deriving dimensions, or, more precisely, particular relational exchange competences, providing the definitions and relating these competences to particular relational and performance outcomes. The following definition of competence* is adopted: "an underlying characteristic of a person in that it may be a motive, trait, skill, aspect of one's self-image of social role, or a body of knowledge which he or she uses" (Boyatzis, 1982: 21).

The next section provides details on the methodology of this study.

5.4. Methodology

5.4.1. Longitudinal case study

In order to answer the research questions we have chosen a longitudinal exploratory case study design for the empirical investigation. A case study allows for the gathering of rich data on the phenomenon under investigation, including the data on the context in which the phenomenon occurs (Pettigrew, 1990; Yin, 2002). The exploratory, or inductive, type of case study is particularly useful when theory building is the goal of a research effort (Yin, 2002). In our case the inductive approach is appropriate because the body of knowledge on the effect of auctions on boundary spanners' role constraints and, especially, the body of knowledge on boundary spanners' relational exchange competences, is not sufficiently developed to permit a deductive, hypothesis-testing investigation. In these circumstances, an inductive case study method would allow the tracing of the nature and workings of the boundary spanners' relational exchange competences in great depth and detail, which is necessary to inductively build up a basis for a theory.

Investigation of the effect of auction outcomes as well as of the role and effect of boundary spanners' competences during the project run requires the observation of causal relationships within and across a number of situations in which such effects manifest themselves. Such investigation is best served by a longitudinal type of study.

The longitudinal aspect provides a rationale for a single case research design, due to its ability to deal with theory that examines the change in certain conditions over time (Yin, 2002). It also improves the measurement validity and provides more space for alternative interpretations of data (Franz & Robey, 1984).

More specific rationales for using a longitudinal case study design are connected with the nature of the investigated phenomenon. Studying relational exchange competences, i.e. something that has to do with the dynamic realm of inter-organisational relationships, requires observation of the relationships during the process of their development, including changes in environmental characteristics and consequences of specific actions. Relationships may develop in an incremental way, where "for example, a small investment in the relationships by one party might increase the trust of the other party. With greater trust, the other party makes a larger investment that increases the trust of the first party" (Weitz & Jap, 1995: 311). Finally, collecting data on processes as they take place helps to avoid reporting bias, which can be an issue when respondents have to report on a number of episodes that have occurred at different points of time along the duration of a project.

5.4.2. Case selection and data collection

In choosing a suitable case we used theoretical sampling strategy to enable generalization to theory, as recommended by the methodological literature (Eisenhardt, 1989; Yin, 2002), rather than statistical sampling that is appropriate for generalizing from sample to population. From this perspective, an ideal case should allow for access to the respondents and the research site(s) over the extended time of a longitudinal case study, and for observing and assessing the theoretical phenomena in question (auction outcomes, boundary spanners' pressures, boundary spanners' relational exchange competence and project performance). Naturally, we were interested in a case where the contracts for construction services were allocated by means of online reverse auctions. In September 2005 we were introduced to the key stakeholders of an appropriate project by NegoAuction, a company that provides procurement services based on its proprietary online reverse auction platform.

A case that satisfied the above conditions was a project for the remodelling and renovation of the headquarters of a municipal agency in Amsterdam, undertaken in 2005-2007. The initial project plan was based on the expected project duration of around two and a half years. We constrained our investigation and analysis to Phase One of the project, which had to be accomplished by April 2006 with the delivery of a facility that was crucial in the services infrastructure of the Agency, had a high political importance and represented in itself an independent module in the whole renovation and remodelling project. The timeline of the project as captured by the present case study is presented in Figure 5-3.

The data collection efforts spread across ten months of the field study, from September 2005 to July 2006. The data collection was divided into three stages, as shown in Figure 5-3, and focused on a) the auctioning and start-up stage of the work; b) the

project and relationships dynamics at a more mature stage of Phase One and c) the final stage of Phase One.

Twenty-eight interviews were conducted. We conducted interviews and follow-up interviews of contractors' project managers, employees of the client organisation, a foreman, architects, an installation consultant, procurement consultants and the employees of an organisation that provided the software for reverse auctions and organised the auction event. The interviews were semi-structured: the design of the interview guide was evolving as the project progressed and the data collection focus was adjusted. Detailed field notes were taken during the interviews, and all interviews were tape-recorded and transcribed (and translated from Dutch into English, when necessary) shortly afterwards. Some of the interviews were followed by a phone call and/or email. The details of these interviews are provided in Table 5-1.

Apart from the interviews, we also employed other sources of data, such as participant observations (all at the Agency's premises), documents (planning diagrams, meeting minutes, company leaflets) and corporate websites. Observation 1 (Figure 5-3) took place on the day of the auction event: one of the researchers was allowed to be present during bidding for Lot 2 at the Agency's premises. Observation 2 took place during a meeting of the construction team (including representative of the Agency, two contractors' project managers and representatives of the architectural and installation consulting companies: see Table 5-2) at the Agency's premises. Planning diagrams and meeting minutes were particularly insightful as they allowed us to trace the project's actual progress against the planning and related project stages to the specific actions of boundary spanners. They also provided additional information for triangulation with the interview data.

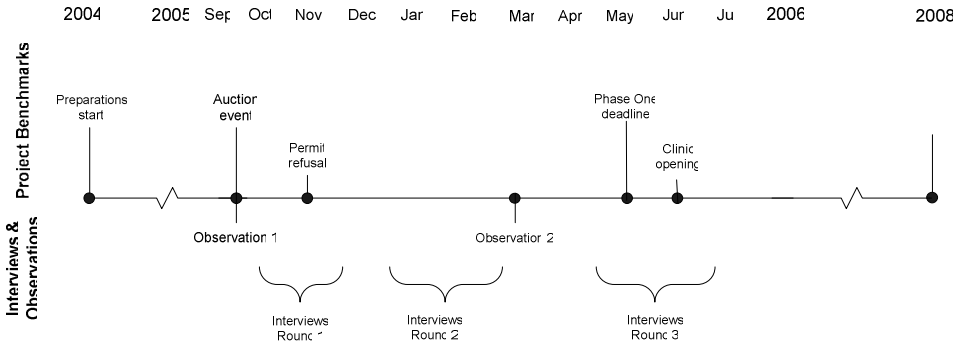

Figure 5-3. The Agency headquarters renovation and redesign project benchmarks and case study data collection.

Table 5-1. Interviewee type and the number of interviews in the case study[30]

Company	Interviewee	Pseudo-nym	Number of Interviews	Dates
The Agency	Head Facility Management	James	5 (incl. 1 phone interview and 1 not recorded interview)	07.10.2005, 15.12.2005, 28.02.2006, 30.05.2006, 21.03.2007
	Head of Housing	Wouter	3 (including 1 phone interview)	24.02.2006, 01.03.2006, 28.06.2006
InCo	Director	Elliot	1	01.02.2006
	Project Manager	Ben	3 (incl. 1 phone interview; Dutch)	16.01.2006, 31.03.2006, 09.06.2006
ConCo	Director	Patrick	1	25.01.2006
	Project Manager	Ronald	3 (Dutch)	25.01.2006, 05.07.2006
Architects Co	CEO	Kenny	1	09.09.2005
	Vice-Director	Ron	3	05.10.2005, 05.01.2006, 16.05.2006,
	Project Manager	Frans	4 (incl. 1 phone interview)	28.09.2005, 23.01.2006, 19.04.2006, 24.05.2006
	Floor Manager	Jan	1	15.12.2005
Installation Advisors	Director	Willem	2	23.03.2006, 07.06.2006
NegoAuction	Consultant	Jan1	1	10.10.2005
Procurement Co	Consultant	Ron1	1	10.10.2005
Total			28	

[30] Pseudonyms are used for the names of companies and people involved for the sake of protecting their privacy.

5.4.3. Case introduction

The present case study focuses on a building re-design and renovation project commissioned by a municipal healthcare agency based in Amsterdam, the Netherlands. Founded in 1901, the Agency is the oldest and the largest municipal healthcare organisation in the Netherlands and employs around 1,200 people working in 35 locations across Amsterdam. The Agency is responsible for a range of activities in the domain of public healthcare, including the ambulance service, the maintenance of a central emergency room for all emergency services in Amsterdam, parent and child centres and a pest control service, etc. The infectious diseases arm of the Agency takes care of the treatment of contagious diseases such as measles and meningitis, provides vaccinations for travellers abroad and maintains an outpatients' clinic for sexually transmitted diseases. The latter, further referred to as "the Clinic", provides anonymous examination and treatment to over 22,000 visitors on a yearly basis.

Several hundred Agency employees are based at its Amsterdam headquarters: an 8-storey, 19th century building that has the status of a "Rijksmonument" (i.e. national monument) and is protected by law. Some of the Agency's mission-critical facilities, such as the regional microbiological laboratory, are also located in the main headquarters building and several smaller adjacent buildings.

In the years before 2005, the conditions of the headquarters building had become increasingly unsatisfactory for the Agency due an outdated internal infrastructure, the evolving demands of the tenants, pressure on efficiency and rising workspace standards. In response to this situation, the Agency decided to remodel and renovate its headquarters.

Apart from the interior remodelling and redecoration (including changes in the layout of some of the rooms, plastering, etc) and replacement of water pipes, data networks, upgrade of the air-circulation systems and replacement of the canteen and kitchen equipment, the project included relocation of the Clinic from a site in Amsterdam to the headquarters building. Challenges to the Clinic relocation were related not only to preparing a new space and physically relocating the Clinic. The relocation had to be well planned and announced well in advance, as the Clinic operates largely on a confidential and anonymous basis (i.e. the Agency did not have its clients' contact information) and therefore not all the patients or clients could be directly informed about the relocation. This imposed additional importance on the strict compliance with the project plan.

In addition, the senior management of the Agency had substantial commitments to donors and the public with regard to the timely delivery of the Clinic. James, the head of the Agency's Facility Management Department, considered the Clinic a key delivery of Phase One, and repeatedly emphasized the importance of its delivery on time:

James (October 2005): "But you have to realize that the Clinic is not up for negotiation. We made this clear from the beginning. Not for negotiation planning-wise. But the rest, everything that's going on with the permit, things that cannot go on the roof and new type of design that we have to make – this is going to change a little bit… But the Clinic will have to be ready on March, 17, whatever happens."

Table 5-2. Parties involved in the Agency headquarter redesign and renovation project[31].

Party	Description	Representatives	Involved in proj. execution
The Agency	Municipal healthcare organisation based in Amsterdam; headquartered in a historical building close to the city centre.	James, Head of Facility Management Dept Wouter, Head of Housing Jan, foreman	Yes
Architects Co	Company hired by the Agency to design and manage its headquarters redesign and renovation project.	Kenny, Director Ron, Vice-director Frank, Project manager.	Yes
Installation Advisors Co	Installations consulting company; involved before the auction in the design phase; involved as a consultant at the execution phase.	Willem, Director	Yes
Procurement Co	Procurement consultancy with experience of organising European tenders.	Ron, Consultant	No
NegoAuction	Provider of online reverse auctions platform	Jan, Director Elliot-Jan, Consultant	No
ConCo	Construction company	Patrick, Director Ronald, Project manager	Yes
InCo	Installations company	Elliot, Director Bobby, Project manager	Yes

[31] Pseudonyms were used instead of most of the people's and companies' names in order to preserve confidentiality.

The overall building space to be remodelled and renovated represented around 50% of all facilities occupied by the Agency in Amsterdam. According to estimations made prior to the tender, the monetary value of the project exceeded 9 million EUR.. The project was divided into three parts, which had to be carried out in parallel but represented three separate contracts: building construction, installation of electro-technical equipment, and installation of the air-circulation system and utilities. The latter two contracts also included ten-year maintenance commitments.

Within the Agency, the leading role in setting up and conducting the renovation and remodelling project belonged to the "Afdeling Facilitair Bedrijf", i.e. the Facility Management Department. This department was responsible for the success of the project and managed the relationships with all external parties involved in it.

Several other parties were contracted to devise specifications and planning for the headquarters renovation and remodelling project. *Architects Advisors and Project Managers Co* (further referred to as *Architects Co*), a construction design and project management bureau, was responsible for the detailed design of the construction part of the project and subsequent project management. *Installation Advisors Co* (further referred to as *Installation Advisors*), an installations design and consulting company, produced detailed specifications and drawings of the two parts of the installation works, i.e. Elektrotechnisch (electrical and data networks, wirings, light, etc.) and Werktuigbouwkundig (air-conditioning and utilities).

The three contracts for the project were allocated by means of an online reverse auction event on September 9, 2005[32]. In each of the three auctions three bidders took part: as a result, the construction contract was allocated to ConCo, a construction company, and InCo, an installation company, won the two auctions for electrical and utilities installations contracts.

ConCo is a relatively small Dutch construction company with over 30 years on the market, specialized in construction and remodelling work in the healthcare sector. Its primary clients are hospitals and medical laboratories. ConCo is a part of a major Dutch construction holding with several billion EUR of turnover.

Ronald is an experienced project manager, in his forties, working for ConCo for several years. He started his career as an auto mechanic and later moved into construction.

InCo is a Dutch subsidiary of a publicly-traded pan-European engineering company with several billions EUR of turnover. InCo has a regional office in the central Netherlands focused on electrical engineering projects in building construction.

[32] The auctions will be discussed in detail in Section 5.5.

Bobby, the InCo's project manager, is in his thirties and has been working as a project manager for the last 7 years. Just like Ronald from ConCo, he was an auto mechanic early in his career.

In construction projects, project owners (clients) are not actively involved in operations during the construction stage. In our case, Architects Co acted as the project owner's agent, a role that encompassed the management of relationships with the contractors on the Agency's behalf, ensuring the compliance of the work progress, scope and quality levels with the specifications, planning and contractual terms, and also resolving disputes. Further in the discussion we will refer to the Agency, Architects Co and Installation Advisors jointly as the "project owner side". However, the employees and management of the Facility management Department were still involved in some communication with the contractors over operational issues as well as in biweekly construction team meetings. At the same time, intensive communication between the contractors and advisors took place on a daily basis.

Table 5-2 contains a brief description of all parties involved in the project at different stages.

5.4.4. Analytical strategy

In order to produce an "analytical generalization" (Yin, 2002) we went through several steps in the analysis, from the raw data to theoretical concepts and the specification of causal relationships. The steps in this analytical process are similar to the ones undertaken in other inductive case studies of IS and organisational phenomena (Levina & Ross, 2003; Sabherwal, Hirschheim, & Goles, 2001). The intermediate and final deliveries of the analysis were also roughly in line with Pettigrew's three types of analysis output: analytical chronology, diagnostic case and theoretical case.

Step 1. Analysis of raw data. Prior to starting the fieldwork we developed a set of codes on the basis of the main relevant streams of literature and a set of the sensitizing beliefs as suggested by (Miles & Huberman, 1994). Because in our longitudinal case study the gap between the first and last interviews had been expected to exceed one year, we started coding the interview transcripts soon after the first interviews had been carried out. This also allowed us to update the list of codes in the course of the analysis, as new information was acquired and some of the sensitizing beliefs were adjusted.

As the coding progressed, the interview transcripts were re-arranged and relevant chunks of data were grouped according to the themes of the assigned codes. For coding and regrouping the data we used a software tool for qualitative data analysis Atlas.ti. The total size of interview transcripts exceeded 200 pages.

The causal links emerging within and between the themes were turned into a visual form and analyzed by the means of causal diagrams (Miles & Huberman, 1994).

Step 2. Initial case write-up. Bringing the analysis of the raw interview data to a higher abstract level overlapped with the development of the first iterations of case study write-ups, which were used for producing reports for different stake-holders of the building redesign and renovation project. Different versions of the reports were prepared, for example, for the Agency and for the two contractors. This was done in order to maintain confidentiality of sensitive information.

The company reports were sent to the study participants, and then discussed over the phone or in personal meetings. The feedback provided validation of the relationships between the emerging concepts, and contributed several new insights.

Step 3. Producing analytical generalizations. The next step was moving from the initial case write-ups to a theoretical case. The process involved intensive collaboration and going through a number of iterations of the case with a number of parties. The work regarding the data processing and analysis was conducted by the author under the supervision of two senior faculty members. This group of researchers would periodically meet to discuss the progress and challenge each other with new ideas and alternative explanations of the observed phenomena. One of the more mature versions of the theoretical case was presented to a group of academic colleagues at a research seminar, and the feedback resulted in further revisions of some of the constructs and links between them. Overall, one year passed between the earliest and latest versions of the theoretical case, with several iterations occurring in-between.

In order to systematically examine project managers' role constraints and relational exchange competences in interaction with their context, we used the Pettigrew's contextualist approach (Pettigrew, 1990), which encompasses several key elements: 1) embeddedness of the phenomenon under investigation in multiple interconnected levels of analysis; 2) temporal interconnectedness, i.e. locating and investigating the phenomenon in past, present and future time; 3) mutual influence of context and action and the need to explore both in their interrelation; 4) development of "holistic and multifaceted" explanation of the phenomenon, rather than explanations based on singular and/or linear causation (Pettigrew, 1990). Below we explain how each of Pettigrew's elements was realized in the context of our study.

First, in the present research the discussion of relational exchange competences and their outcomes considered two levels of analysis: individual (project manager) level and project level. The boundary spanner level is addressed by the discussion of the impact of reverse auctions on boundary spanners' pressures, as well as by the discussion of relational exchange competences. The project level is represented by the discussion of the project performance. An interplay between these two levels of analysis is inherent to explanation building.

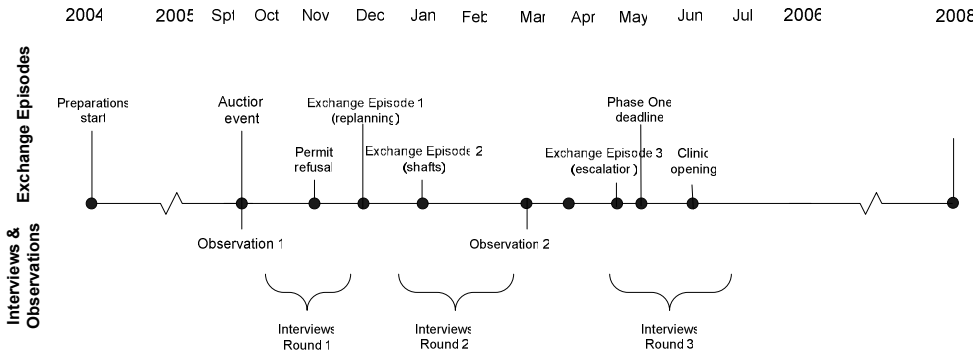

Figure 5-4. The Agency headquarters renovation and redesign project and case study timeline.

Second, the longitudinal nature of the empirical investigation allowed for observing and analysing temporal interconnectedness in explanation building. For instance, in order to reach conclusions with regard to the effect of auction outcomes on project managers' role constraints we drew upon several situations at different points in the project run where these effects revealed themselves in the most visible ways. Similarly, when considering project managers' relational exchange competences we had to analyse their actions both within the context of preceding events (e.g. disputes over prices) as well as in relation to expectations of future events (e.g. forthcoming project milestones).

Third, the mutual influence of the context and action was taken into account in the analysis of the impact of project contingencies (e.g. appearance of government rulings) on the actions of the individuals in the construction project. The individuals would respond to the changes in the context by suggesting and negotiating changes in the building design and project plan that would further affect their work.

Fourth, we were trying to produce a "holistic and multifaceted" explanation by challenging ourselves with alternative explanations of the observed phenomena. The alternative explanations are presented in the Discussion section of this chapter.

A final note that needs to be made with regard to the methodology is that one relating to the narrative. The case study format provides the researcher with an opportunity to choose to arrange the narrative in a way that better displays the theoretical value of the empirical situation and findings (Van der Blonk, 2003). In order to avoid what has been called "death by data asphyxiation" (Pettigrew, 1990) and structure the case narrative, we adopted a technique that is similar to the narrative strategy of presenting and analysing process data (Langley, 1999). For the purposes of arranging the narrative and making sense of the data, in describing the case study we focus on sev-

eral situations during the execution stage (further referred to as "exchange episodes") that are characterized by a high level of contingencies and/or escalation of relationship between the parties. Focusing on such exchange episodes helps understand the behaviour of the boundary spanners under the influence of contingencies as well as the interaction and relationships between the parties. Figure 5-4 displays the exchange episodes in the context of the project and case study timeline.

5.5. Reverse Auctions and Their Outcomes

5.5.1. Auction preparation and bidding

The so-called European procedure for tendering applied to the sourcing process due to the project size and the fact that the Agency is a municipal organisation. The procedure implies that the announcement of the tender has to be placed into a European tender database and exposed to potential participants in all 25 (at that time) EU member countries. About 30 companies expressed an initial interest in the project.

The procedure consisted of three main stages. First, for each of the three auctions five participants were selected by Architects Co and the Agency, and allowed into the next round on the basis of their qualifications. Second, these semi-finalists submitted packages with more detailed information and their proposed prices. Prior to the third stage (auctions), the company with the highest price had to be excluded from further participation, which is a standard practice of tenders for construction services: therefore, four companies were allowed to bid for each of the three contracts. In reality, shortly before the submission of the packages, a company that was a finalist in all three auctions unexpectedly withdrew from participation[33], leaving each of the three auctions with just three bidders.

The third stage was the auction event that was prepared by NegoAuction, a provider of online reverse auction services, and Procurement Co, a procurement consultancy, and took place on September 9, 2005. Three distinct lots were auctioned consecutively from approximately 9.30 am to 6.30 pm.

The participants' starting bids in the auction were those submitted at the previous tender stage. Minimum bid decrements in the three auctions were 30, 30 and 20 thousand EUR respectively. The bidders did not have full information about the prices of their competitors. They could, however, observe their own current rank in the competition and the monetary amount that separated them from the first place (if different from zero). Further, the auctions were based on a price/quality scoring rule. The rule gave 95% weight to bid price and 5% to supplier quality score in bidding for the construction lot, and a 90%/10% ratio in bidding for the installation contracts. The

[33] The supplier claimed that it did not have enough manpower to prepare the necessary documents in time due to the summer holiday season.

scoring rules and quality score were determined and communicated to bidders prior to the auction.

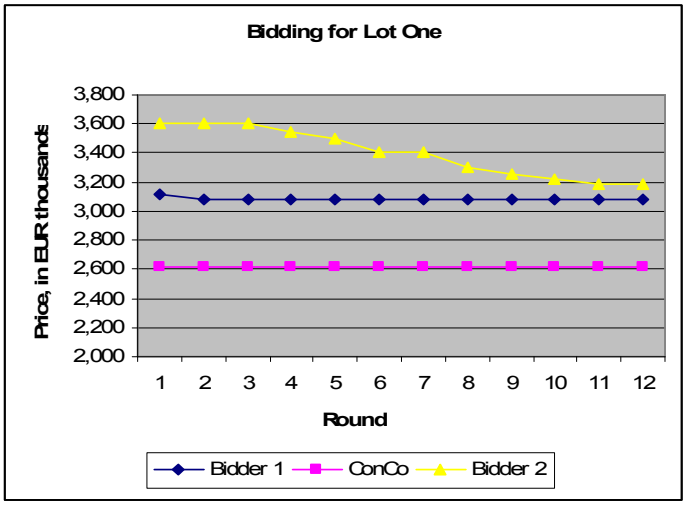

Figure 5-5. Bidding for Lot One – the construction remodelling and renovation contract.

The bidding dynamics at the three auctions are presented in Figures 5.5-5.7. At the construction auction (Figure 5-5) there was no competition for the first place, as the bid submitted by one of the bidders, ConCo, was unrivalled.

The final price of Lot One was above the initially-estimated cost. The difference between the estimated cost (EUR 2,364,631) and the winning bid (EUR 2,617,493) was EUR 252,862, i.e. the auction did not result in a price decrease compared to the estimation. The price/quality scoring rule did not affect contract allocation due to a large gap between the winner's bid and the bid of the closest competitor.

Auctioning Lot Two, however, was more successful from the viewpoint of the tender team. Two suppliers were competing fervently for the first place for ten rounds, which resulted in a final price for the electrical equipment installation and maintenance contract (EUR 3,260,000) being EUR 1,180,000, or 27% lower than the estimation (EUR 4,440,000). Interestingly, the winner in this auction was not the lowest bidder (the winning bid was EUR 10,000 higher than the lowest competitor's bid), due to the price/quality scoring rule (Figure 5-6). The winner's quality score was 83.7%, while Bidder 4's quality score was 75.2%. Although the quality score accounted only for 10% of the overall score, the implication of this difference was that Bidder 4 would have to propose a price below EUR 3,235,000 to rival the winner's

bid of EUR 3,260,000. And, since the minimum bid decrement in bidding for this lot was EUR 30,000, the next possible bid for Bidder 4 was EUR 3,220,000.

Figure 5-6. Bidding for Lot Two – the electro-technical equipment installation and maintenance contract.

The price of Lot Three (EUR 2,499,100) was EUR 219,100 higher than the estimation (EUR 2,280,000), despite intensive competition between two of the three bidders (Figure 5-7). The bidding was won by InCo – the company that had also won bidding for Lot Two. In this case the quality score of Bidder 3, who was the second lowest bidder, was slightly higher than that of the winner, InCo (87.7% vs 85.6%). However, this difference was not enough to make up for the EUR 6,900 difference between the final bids of the two companies. Moreover, in order to secure the leadership Bidder 3 would have to bid EUR 2,486,000 in the next round (bid decrement of EUR 20,000).

All in all, savings from the three auctions totalled EUR 708,038 respective to the initial estimation of EUR 9,084,631. Compared to the starting price, the overall reduction was EUR 491,770. The overall result was seen as a moderate success by the Agency and the tender team, since not all individual auctions resulted in price reduction compared to initial estimations.

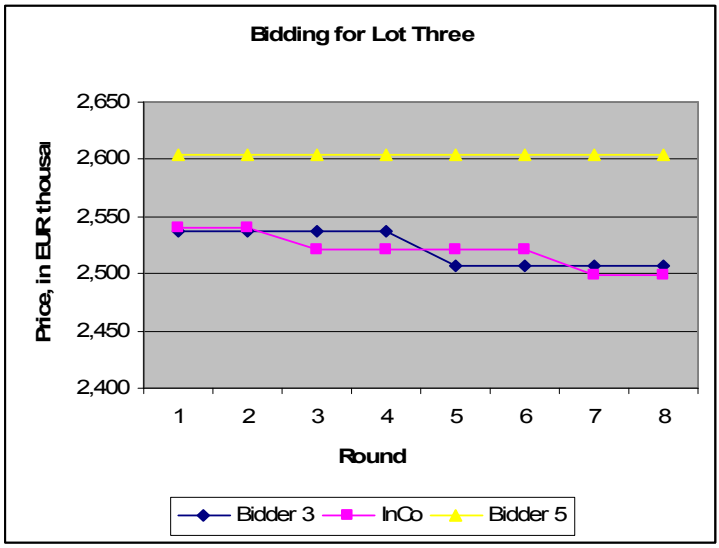

Figure 5-7. Bidding for Lot Three – the air-conditioning and utilities installation and maintenance contract.

As a result of the bidding, the two winning contractors committed to hundreds of pages of specifications and drawings developed by Architects Co and Installation Advisors Co for the construction and installation parts respectively. In addition, the winners had to submit detailed calculations with the types and prices of the construction and installations materials and equipment to be used in the projects. These calculations were approved by the Agency and external municipal bodies before the final commitment was made.

5.5.2. Bidding strategies

We had an opportunity to gain an insight into the valuations and bidding strategies of the winning bidders by interviewing their respective decision-makers. Both at ConCo (winner of the construction lot) and InCo (winner of the installation lots), company directors were responsible for bidding. The two directors, however, had different standpoints in relation to reverse auctions, which had profound effects on their respective bidding strategies.

Patrick, the Director of ConCo, saw auctions primarily as a "haggling" ritual. In his understanding, by making progressive price concessions during the bidding process a bidder creates an impression that whatever its price is, it is still "negotiable" and there is a space for further reduction:

> *Patrick (director of ConCo): "We call this… a Turkish market… I want to buy the shoes and you tell me 10 dollars – No, 5. – No, 9 – No, 6… That's what we call "Turkish market", haggling. It's not a negotiation… I do not agree with that process."*

The director was anxious that this approach to bidding would undermine the integrity of his company's position during the project run:

> *Patrick (director of ConCo): "You should say your price is your price; during the process you should maintain that vision. Because otherwise the discussion goes on…"*

Therefore, his decision was to bid his "valuation", i.e. cost plus a standard profit margin:

> *Patrick (director of ConCo): "When I thought of a strategy for the auction, I thought I'm not the Turkish guy with a leather case… I'm just a contractor and I know what is my price, what is the amount of money I want to have… So we approach it just like we give an envelope."*

As a result, ConCo did win the auction by bidding its claimed valuation, but at a price considerably below its competitors.

Quite an opposite approach was demonstrated by the second winner. InCo was gradually lowering its bid price until the competitors dropped out. InCo's director Elliot fully realized the opportunity for ratchet bidding (Kamecke, 1998) based on an awareness of their own costs:

> *Elliot (director of InCo): "All I've done during the auction is to calculate. First I try to figure out the score of the other companies. [Interviewer: How?] When I see the figures change I assume who is saying and what they are saying, when I see people go down in 1, 2, 1, 2 I know the strength of their score. So I can calculate that. When I knew that, I could calculate with our score, which I had received in advance, what the new price should be. And I knew how strong it was. I assumed somewhere a low price, which we had calculated, that was the bottom. When I calculated the other scores back, they should be there. They could not get lower than that. (You assume your score was higher? [Interviewer]) Yes, and I calculated, this was done here, I could predict the moment they should stop. And we had our price. And the price we got the job for was higher then the lowest price in a non-auction".*

Elliot repeatedly emphasized that the auction procedure allowed InCo to get a higher price than would have been the case in a sealed-bid auction (if the envelopes had been submitted):

> *Elliot (director of InCo): "In a normal tender there is one single price which will give you the job, yes or no. It should be lower then we have it now. [Interviewer: so in an envelope tender you would have given that lower price?] Yes, you should have to. Because it's only a one-time procedure… Every job you want to have, you have to make a good proposition about the price. The best proposition because it is only one you can do. So when you go to all the trouble of getting an invitation, you invest a lot of time to make the parts. And we only have one chance to get the job. So you have to point out your right price".*

In essence, InCo was able to extract additional gains form the auction by following the dominant bidding strategy, whereas ConCo ended up by winning the project at the level of their valuation[34]. If ConCo had also used the dominant strategy of ratchet bidding, it might well have ended up by pocketing an additional EUR 450,000 (Figure 5-5).

One additional factor for InCo was that it had a complementary effect from bidding in two consecutive auctions. This allowed InCo to win both auctions by balancing gains and losses from the two:

> *Elliot (director of InCo): "I independently bid on both [auctions], but when I knew I had won the auction of one, I used the advantage of that one to get the other one lower. So at the end it was a total price for me. We ended up with a price which was higher then I knew it should be. So I took that price advantage as an extra possibility to lower the other price when it was necessary."*

5.5.3. Effect on role constraints

Overall, as a result of the bidding InCo was likely to be better-off with regard to its profit margin than ConCo, as the bidding strategy of the former allowed it to retain some financial slack above the costs and minimal profit margin. However, we maintain that the role constraints resulting from the auction prices nevertheless were strong for both project managers. This is due to the fact that the overall market situation was unfavourable to contractors – this was the time of a buyer's market, when construction companies were struggling with low demand, when a number of respondents thought the auction prices were quite low, and when even InCo, that did

[34] Here we assume that the respondents' accounts of their valuation were honest.

relatively well in the auction compared to other bidders, had only a modest profit. The opinion was that ConCo was on the edge of losses in the project, perhaps as a result of price miscalculations. Unfortunately, we could not access the actual financial data of the companies as it was considered commercially sensitive information.

It seems likely that the auction prices (and consequently the role constraints) were affected by the economic conditions of the construction market. At the time when the Agency was preparing and conducting its auction event, the economic conditions in the Dutch construction market were such that the capacities of the construction companies were in excess of demand for construction services. Respondents explicitly characterized the situation as a "buyer's market". This situation put the Agency in a strong negotiation position versus its suppliers, and was favourable for the use of the reverse auctions. This is how some of our respondents summarized the market conditions:

> *Ron (Procurement Co BV, procurement consultant; September 2005): "We thought that there's a lot of competition in this market, there're a lot of suppliers who really want to bid for this interesting project …we think [thought] that the market is such that they want to have work, so there will be a lot of people to join the auction."*

> *Willem (Installation Advisors Co, director; March 2006): "At this moment in Holland the prices are very low. A lot of firms are getting killed."*

5.6. Project Execution, the Effect of Reverse Auctions and the Behaviour of Boundary Spanners

In this section we first discuss the boundary spanning activities of the contractors' project managers in the Agency headquarters renovation and redesign project. Then we focus on three exchange episodes (Figure 5-4) that highlight important benchmarks during the contract execution phase and reveal the effects of reverse auction outcomes on project managers' role constraints as well as their behavioural responses to such situations.

5.6.1. Boundary spanning activity of contractors' project managers

The boundary spanning activity by Ronald and Bobby took many forms during the Agency's headquarters renovation and redesign project. Both contractors' project managers were in charge of coordinating their respective teams on the floor of the Agency's building. This included monitoring the work progress against the plans, and

controlling the work quality. The activities of the team onsite were complicated by the need to perform the work inside an organisation that was continuing its operations: the progress of the construction teams had to be coordinated with different departments of the Agency that had to relocated back and forth to allow the teams to perform the renovation and redesign work, and the level of the noise during the construction work had to be monitored.

The project managers had to be constantly in touch with each other in order to coordinate the joint work of the installation and construction teams as well as with the other parties, such as Installation Consultants Co and Architects Co. The relationships with the Architects Co were the most crucial as its employees had to manage the project on behalf of the Agency and as such to monitor the conformity of the contractors' work with the plan, budget and quality level, as well as engage in coordinating activities with the Agency's Facility management and other departments regarding departments' relocations?, providing access to different parts of the building, and so on.

The construction team, consisting of the contractors' project managers, the director of Installation Consultants Co, a project manager from the side of the Architects Co and the head of the Agency's Facility management department, held biweekly meetings where the project progress was evaluated and any relevant issues regarding planning, budget or quality were discussed.

In the course of the case study interviews, it emerged that other project stakeholders placed a high importance on those individuals occupying project management roles in the contracting companies, and related the success of the whole project to the performance of these individuals:

> *Patrick, director of ConCo (Commenting on InCo): "You have so much [many regional offices] of InCo - in Amersfoort and other places… It's not the company, it's the people [that account for the success of a project]. It does not matter if it is InCo or another party… It is a project manager from InCo who makes the job - that counts, not the company."*

> *Willem, director of Installation Advisors Co (Commenting on one of the contractors): "It's a very good firm but I always say that it is the people who are working for that firm make that firm or break it down… This is the man who is in charge, who is leading the project..."*

Tellingly, the importance of a good project manager was placed even above that of a particular company.

5.6.2. Project execution

Exchange episode I. Plan renegotiation (October 2005 – November 2005).

Shortly after the work had started an unexpected development took place. According to the building design, the roof of the headquarters building had to accommodate a new, more powerful, air-conditioning system. However, a governmental body responsible for protection of historical monuments that oversees this kind of change refused to grant the permission due to the historical value of the building.

The project ran into a bottleneck and a solution to the problem had to be found quickly, as the progress of the work on other parts of the building depended on the air-conditioning system and especially on the ventilation shaft that had to go through the building from the top all the way to the bottom. After several weeks of discussions between James, Ron (Vice-Director of Architects Co) and Willem (director of Installation Advisors), an adjusted design was put forward. It was decided to install the air-conditioning equipment in an adjacent building. Consequential to this decision was the need to adjust the location of the ventilation shafts in the building. The adjacent building also had to undergo renovation, which increased the overall project budget.

However, changing the design was only part of the solution. The adjusted design also had to be translated into a new work plan for the contractors, whose first reaction to the changes was to significantly increase the time requested to accomplish Phase One. The first version of the adjusted plan proposed by ConCo and InCo incorporated a delay to the delivery of the Clinic of approximately six weeks. This was not acceptable to the Agency, considering their obligations and political factors. Therefore, Architects Co responded with a counter-offer to cut the delivery time by six weeks: for this purpose, the sequence of tasks to be carried out during Phase 1 was rearranged. The contractors, however, still thought the plan was too tight. It was not until January 2006 that the parties were able to settle for a compromise. In the final version of the plan the Clinic delivery was still delayed by about three weeks compared to the original plan.

The effect of auction outcomes

The need to adjust building design and the project plan highlighted a twofold effect of auction outcomes on the contractor project managers' role constraints. First, their willingness to increase the time needed to accomplish the Clinic was driven by the desire to avoid adding workers to their teams that would drive costs up for their firms. Second, the fixed price nature of the contract (which is not a direct consequence of the auctions but it is strongly associated with this allocation mechanism (Bajari et al., 2006; Stark, 1974)) by its nature allows less flexibility in dealing with contingencies than do more flexible time-and-material contracts, thus aggravating project managers' constraints in delivering the expected results.

Behavioural response of contractors' project managers

This situation revealed differences in the approach of the project managers of ConCo and InCo to the negotiations with the project owner side. Ronald of ConCo saw the unexpected changes to design and plan as impediments to the normal project run, defined by original specifications and plan. When discussing his negotiation behaviour, he explained to the interviewers that his initial rejection of the new plan was a result of a disagreement with the suggested terms (rather than a tactical intent to reach a compromise).

Quite a different understanding of the negotiations was demonstrated by Bobby of InCo. Bobby saw the project as a "game" played by the customer and contractors, where parties consciously use negotiation strategies to reach a compromise solution. Bobby's strategy was to deliberately overstate the need for extra time in the first version of the adjusted plan, assuming that a similar strategy was being pursued by the other party. The goal was to reach a middle ground after several rounds of negotiations involving mutual concessions. In such a "game", parties' behaviour was determined not so much by the formal routines of the project but by the understanding of the goals and behaviours of their counterparts:

> *Bobby: "With the planning, you always have to learn this… The first planning [is done] with the thought that: "If I do something - you always have some criticism". So, what you do with your first planning, we already knew in advance they would not agree. So, we thought we could do this, and than we added another 3 or 4 weeks, because they will be claiming them back. So, they send it back with the remark that is should be six weeks shorter. So, we say 6 weeks is too much. So, everyone starts making a noise and then we agree on something in the middle, which is about the thing we had in mind at first. This is how it works in life right…"*

The outcome of such gaming behaviour looks more like a compromise solution than a win-lose situation. We call this behaviour 'benevolent gaming' and analyze it in more detail in Section 5.6.4. For the project owners and contractors this behaviour resulted in an intensive negotiation exercise and provided an opportunity to get to know each other better. On the contractor's side, Bobby appeared to be more flexible and insightful in negotiations than Ronald.

Exchange episode II. Price renegotiation (January – June 2006)

In the construction industry the work is not part of the initial specification, but at the same time does not entirely fall outside the scope of the project handled by the means of change orders ('meer- en minderwerk' in Dutch). For example, this can be some previously-unanticipated details of the work (e.g. the soil is harder to excavate than expected) or new requests from the project owner. Contractors compose such change

orders, which are subject to approval by the client. However, more significant changes to the initial specifications can be more difficult to deal with if they can be argued to be a new project, rather than an extension of the main project. In this case, the terms of the initial contract (e.g. prices in the Bill of material) do not apply and new terms have to be negotiated. The key difference with the "meer- en minderwerk" is that the basis for price calculation (detailed prices for types of work and materials agreed upon at the tender) can be questioned.

When it became known that the ventilation shaft had to be constructed in a different part of the building as a result of the permit denial, ConCo came up with a new calculation of the price for its own part of the work. To the surprise of the project owner's side, the price of the shafts was EUR 145,000, a 3.5 times increase over the initial price of EUR 40,000. As a key reason for the large price change, ConCo suggested an error in its original calculations. Ronald also argued that building a shaft in a different place was equivalent to a new project, to which the base prices fixed in the tender would not apply.

Architects Co reacted with indignation. Frank, the project manager responsible for the project from Architects Co's side, believed the demand for the price increase was outrageous. He considered ConCo's demand a clumsy attempt to cover some of the losses, which, in his opinion, ConCo incurred due to the low price of the project.

After this clash, the communication between Ronald and Frank stalled. Frank refused to discuss this pricing issue as he felt the differences in the positions were too wide to be bridged on the manager's level. As time was passing by, the argument was affecting all project parties in terms of managerial time and effort spent to resolve it. The deadlock eased only after a special meeting in February 2006, at which James urged the parties to solve the problem, which he saw as a threat to the timely delivery of the Clinic. The parties had to agree to proceed with the construction of the shaft and to return to the discussion of the prices later on. The issue itself was not entirely removed from the agenda until as late as June 2006, although the parties at that time were already discussing a compromise price of around EUR 50,000 – much less than initially demanded by ConCo.

The effect of auction outcomes

Unlike in Episode I, in Episode II ConCo was the only party suffering from the contingency. However, the way that the auction outcome and contingency affected Ronald was similar to the situation in Episode I. Here, again, the constraints imposed on Ronald's behaviour as a result of the auction outcomes manifested themselves, because the low contract price did not allow ConCo capacity to absorb the losses from the calculation mistakes and made Ronald look for ways to cover the loss. In addition, the fixed price nature of the contract did not allow ConCo to negotiate and allocate additional budget to the shafts as a cost-plus contract structure would have allowed (Bajari et al., 2006).

Behavioural response of contractors' project managers

An important effect of the argument over the shaft price was that it seemed to have undermined parties' benevolence trust (Ganesan, 1994) in each other. The tactics adopted by Ronald resulted in a clash with the project owner's side, and prevented him from getting support from the project owner's side in jointly finding a compromise solution:

> *Frank (Architects Co): "When they make mistakes in calculations, like in this case, we always want to look with them what we can do about that… When they have really made a mistake in calculations, we can always go about it in another way, for instance by being less tough on them when negotiating other things... We can reduce damage to them, but not in this way. So it has to be a bit more like… we do it together, cooperative, but they also should trust us a bit that we won't squeeze them [makes a squeezing sound] in the next two years."*

Ronald, however, believed in voicing his concerns and trying to solve them on the spot, despite the arguments this tactic often provoked:

> *The meetings are normal and healthy... And also in these meetings it is allowed to sometime smash heads. Because you should be able to tell one another clearly and honestly what is the situation. That is what happens, we are doing that, so we do not speak Spanish…*

Bobby was not directly involved in the discussion of the shaft prices. However, his approach to potential conflicts with boundary spanners was somewhat different:

> *Bobby (InCo): "Look, you are always dealing with people. How does someone on the opposite side of the table react when I say "Don't be tough on me, it already costs me this much?"... Then if everyone is ok with it, then you have a good project. Well, yes, and if they are not, it has to come from some side. [It's a bit of giving and taking], and how you exactly do this, when you do and when you don't – that is a matter of feeling each other and seeing how the project works out. Look, you can start with lining up tough from the beginning "I need this, and that and bla-bla-bla" but you know it will bounce back at you because you have to deliver together."*

Throughout Phase One of the project, Bobby had successfully applied these tactics in discussing issues regarding the installations specifications with Installation Advisors

Co. When Bobby would come across problems in the specifications he did not try to immediately use them to his advantage but saw an opportunity in such problems for achieving a mutually beneficial outcome (Malhotra & Bazerman, 2007) in the longer run. Bobby worked together with Installation Advisors Co to solve such problems, expecting to be rewarded with easily-approved change orders at a later stage. We call this behaviour a relational exchange competence of *reciprocity* and explain it in more detail in Subsection 5.6.4.

This episode shows that a failure to apply a flexible, accommodating negotiation strategy involving understanding of concerns of the other party, results in missed opportunities, increases management costs (as reported by the respondents) and decreases the benevolence trust.

Exchange episode III. Relationship escalation (April – May 2006)

Starting from October 2005 the construction team held biweekly meetings, at which they discussed operational issues such as work progress, compliance with the planning and budget, potential risks, etc. Frank or Ron (Architects Co), Ronald (ConCo), Bobby (InCo), Willem (Installation Advisors Co) and a few others were the usual participants. At the meetings, Ronald often reported delays in ConCo's part of the work, citing late changes to the interior design introduced by the customer as a key reason. InCo did not report similar issues at the meetings.

At the meeting on March, 28, less than three week before the Clinic deadline, Ronald announced that a delay of 2 to 3 weeks was expected due to the alleged poor quality of the floor and plinths in the Clinic location. This was unacceptable to the Agency and Architects Co, and made them look for an ad hoc solution that would ensure the completion of Phase One on time. They rapidly engineered a twofold response. First, the workload was re-arranged again, so that ConCo could spare more resources to finish the Clinic on time. Second, it was decided to escalate the discussion to a higher management level and to call for a meeting with Patrick, the ConCo director. To strengthen the message, on the eve of the meeting Ron sent an official letter to Patrick, warning them of sanctions in the case that the Clinic relocation deadline on May 8 was not met.

The meeting between James, Ron, Patrick, and Ronald took place on April 13. James and Ron started by expressing their concern over ConCo's performance and emphasizing the need to finalize the work before the deadline. They drew attention to the lack of performance efforts on the part of ConCo, in particular, to poor planning at the manager's and the floor levels. Patrick and Ronald argued that the delays were primarily caused by the late changes in the design that the Agency had made at the last moment. In the end, however, ConCo agreed to work overtime and during the weekends in order to avoid missing the relocation deadline.

Another issue emphasized by James during the meeting was what he saw as underrealized potential for process optimization of ConCo's work at the Agency's site. He

pointed out numerous instances where the work organisation could have been improved if Ronald had taken a proactive approach. One example was the underutilization of trolleys used to deliver materials to the floor under construction. On the way back, these trolleys were empty, while, according to James, it would have been much more efficient to load them with construction waste that had to be later removed anyway.

The opinion on the project owner's side was that the delays could at least partially be attributed to the passive attitude Ronald had to anticipating and solving problems. However, not all of these concerns were openly voiced at the meeting, as Ron and James did not want to further aggravate relationships with Ronald. After the meeting, both sides evaluated the results of the discussion as constructive, although it was universally acknowledged that escalating a problem to the director's level was not good for the relationships between the two sides.

The effect of auction outcomes

The escalation of the Clinic delivery issue to the directors' level was a result of delays that had been piling up on ConCo's side. Some of the interviewees linked these delays to ConCo's unwillingness to increase the size of its construction team on site, as well as to the quality of the team (ConCo once had to replace its foreman per request of the Architects Co). ConCo's resources were constrained and their low profit margin (or negative one) prevented them from expanding their construction teams, even when this was needed. And the source of these resource constraints could be traced back to the auction outcomes, the low contract price, which had not left ConCo much financial slack in allocating their resources for the project.

Behavioural response of contractors' project managers

The critical delay increased tensions in the relationships between the parties. Ronald's standpoint towards the delays was that they were objective and unavoidable consequences of the project contingencies, such as the Agency's late design decisions. Moreover, he did not see such delays as having dramatic effects on the project or on relationships with his counterparts:

> *Ronald (ConCo): "Of course, you do come across the fact that due to changes your work is done later than planned, but all problems are solvable."*

Such an attitude, however, was not shared by other stakeholders, for whom the delays continued to undermine credibility trust in Ronald:

> *James (the Agency): "I would from my side like some transparency so I can know what I can count on. But I still don't know what I can count on. What I can count*

> *on is that if we set a date at the planning – we are not going to make it. That is what I know, so I'm always fighting to make the two weeks, one week. To make the one week two days; to make the two days one day…"*

According to James, this was typical of Ronald's attitude towards work-related issues that required initiative and forward-thinking. This is how James later commented on this issue, emphasizing that Ronald would only see a problem when explicitly pointed to it, which was a sharp contrast to Bobby's proactive, sometimes even slightly aggressive, approach to joint problem solving:

> *James (the Agency): "You know where you see the big difference between Bobby and Ronald? Ronald says: "I understand your problem - I'm going to do my best and I already did my best". And Bobby says: "You are bullshitting; I'm not going to do it that way." - "Why not?" - "Well because these are the risks…" - "Ah, ok, I have not seen it that way, you are right..." Then you are looking ahead… So, he dares to tell you where you go wrong and he does not go along with: "Ok, you are right, and I'll do my best, I did my best and…" He goes on with "If we want to do this together, this is what I think…"*

Ronald, on the other hand, was hurt by the escalation of the problem with the Clinic delay to the management level. He saw this as an expression of low confidence in him as project leader:

> *Ronald (commenting on the meeting on April, 13): "You build up tension when you at a certain point overrule the project leader and get his director involved. Because basically, you state by this action, that you do not have faith in the project leader. And that's a shame".*

This episode shows that, as the spiral of distrust continued to unfold between Ronald and the representatives of the client's side, the relationships were further worsened by ConCo's unsatisfactory performance in terms of meeting critical deadlines. Such a performance seems to have negative effects on competence-based trust as well as on relational norms between the parties. At least some of the roots of the problem lie in Ronald's lack of initiative and forward thinking with regard to solving work-related issues (which can be contrasted by Bobby's display of these qualities). We refer to possessing and using these qualities as a relational exchange competence of *proactiveness*, which we discuss in detail below.

In the meantime, the competence-based trust in Bobby was increasing because of his proactive approach to problem-solving, the good overall performance of InCo and, not the least, because of the contrast with Ronald.

5.6.3. Project performance outcomes in Phase One

After the meeting on April 13, ConCo assigned additional workers to the Clinic site. They worked during the weekends in order to catch up with the delivery schedule. With more workers, the progress was faster, and on April 30 the Clinic was finally ready for an acceptance inspection. InCo was able to finish the work in time and with a high quality level.

The inspection, performed by the representatives of the Agency and Architects Co, however, found a number of issues of the work that did not conform to the specifications or showed a poor quality. One of these issues, for instance, was the ceiling in one of the rooms, which was only half-ready. The inspection team put together a list of such issues and passed it to ConCo for immediate fixing, which cost ConCo one more week to fix. When the relocation of the Clinic started, some of the workers were still finishing the last parts.

By contrast, the quality of the work by InCo did not raise any concerns with the project owner's side, although their part of work was also significant and they had had to follow the pace of ConCo in their progress.

Both ConCo and InCo had some amount of additional work due to design adjustments and late design decisions by the Agency. However, these resulting amounts were not considered by the respondents (particularly, the employees of Architects Co) as anything beyond the normal level in construction projects. The overall budget for Phase One was still exceeded, but this overrun was attributed to the design adjustments that resulted from the denial of permits.

The project owner's side was quite critical in evaluating the work done by ConCo during phase one of the project:

> *Frank (Architects Co): "It costs us too much time and money to get the contractor [ConCo] to do his work."*

When asked whether he would have selected ConCo if in the beginning he had had the knowledge acquired during the project, Frank's answer was strongly negative. The performance of InCo, on the other hand, did not provoke any dissatisfaction. When asked if they would choose InCo for the project, if they had a chance to go back in time to September 2005, our interviewees from the Agency and Architects Co responded with a definite "yes".

Overall, differences in the performance between ConCo and InCo in Phase One were quite visible along the dimensions of quality and time, both of which are key in the construction industry.

5.6.4. Analysis: relational exchange competences of project managers

In this section we discuss three relational exchange competences of contractors' project managers that emerged during the interviews and subsequent analysis of the collected data via numerous iterations. These are: benevolent gaming, reciprocity and proactiveness. Taken together, these three competences seem to capture most of the differences in the behaviour between the two project managers that were important in dealing with the role constraints. As these competences were emerging, we were trying to relate them, where possible, to the existing literature, as suggested by (Eisenhardt, 1989). These dimensions are discussed below.

Benevolent gaming

As demonstrated by Bobby in Exchange Episode I, being able to play "games" with the other parties is an important competence of a boundary spanner, especially at an early stage of a relationship. The term "game" was frequently used by several interviewees (e.g. Frank, Bobby and Patrick, ConCo's director). Our working definition of benevolent gaming is taking certain extreme positions as the negotiations progressed and then gradually surrendering these positions in the process of negotiation with the aim of achieving a compromised negotiation outcome. This type of behaviour is important for several reasons. First, it allows parties to build an understanding of the personalities and business qualities of their exchange counterparts and put these qualities to test. Secondly, it allows for the signalling of cooperative intentions, being at the same time relatively secured against the possible opportunism of the opposite party. Thus, benevolent gaming helps prepare the ground for establishing certain patterns of cooperative norms between the parties. In fact, this is similar to the effect of "social lubrication" that helps make the further negotiations more effective and efficient (Morris, Nadler, Kurtzberg, & Thompson, 2002). Third, if successful, gaming behaviour allows parties to secure their own business interests without harming and alienating the other party. This is also important for future exchange interaction, as negotiators who have a "distributive" reputation (i.e. a reputation for being able to claim value) face more resistance in negotiations and achieve worse outcomes than negotiators without such a reputation (Tinsley, O'Connor, & Sullivan, 2002). In addition, taking a rigid position in negotiations, and aligning one's own behaviour mostly with formal rules and instruction is a characteristic of a limited personal autonomy (Perrone et al., 2003). Such behaviour can alienate the counterparts, as shown by the example of Ronald in Exchange Episode II, during the negotiations over the price of the shafts.

> *A representative of the client's side (January 2006): "Ronald is quite conservative person. Well I'd say [he is] a prototype contractor. I think he's not the type of a man for a job where you need to be very flexible and have to possess a long-term vision… I do not think he sees the impact of this type of game at this stage. I don't think he sees what he does at this moment".*

Gaming behaviour can be related to relational norms in that it promotes information exchange by means of intensive communication about parties' respective negotiation positions and related issues, as well as flexibility, via the process of mutual adjustment.

Interestingly, when the results of the analysis were presented to one of the interviewees at a feedback session, he commented that gaming can also be about cheating: gaming becomes benevolent once the rules of the game become known to and shared by all parties involved, when all parties understand they are playing a game and make it cooperative. Perhaps, the emergence and adoption of a particular set of assumptions or rules regarding the mode of gaming depends in part of the individual styles of negotiators (Kern, Brett, & Weingart, 2005) and their improvisations during the first negotiation encounters (McGinn & Keros, 2002).

As one author has noted in the construction project management literature, on the one hand contingencies during the construction projects can result in conflicts and deterioration of relationships, but on the other hand they provide opportunities for building trust and achieving cohesion between organisations (Loosemore, 1998). Possessing and displaying the competence of benevolent gaming at the initial stages of relationships helps a project manager to achieve his business goals in a cooperative manner, to create mutually beneficial outcomes, and establish patterns of cooperative norms for subsequent exchange episodes even when contingencies are frequent.

The benevolent gaming competence resonates with the skills of influencing, bargaining and negotiation emphasized as necessary in the toolkit of a "competent" boundary spanner in an exploratory piece of research by Williams (2002).

Reciprocity

The second relational exchange competence that emerged from the data is reciprocity. Reciprocal behaviour is conceptually different from gaming behaviour, as reciprocal behaviour emphasizes the need to give away certain benefits to the opposite party as a tactical move to invest in reciprocal relational norms and establish benevolence trust with that party. Unlike benevolent gaming, the purpose of which is to resolve an exchange situation at hand, reciprocal behaviour is primarily oriented towards the future, as by incurring a loss in one exchange episode and gaining in another, parties still can achieve a win-win result over the lifespan of a project. This insight is consistent with the literature on the "shadow of the future", which identifies expectations of the continuity of the exchange relationships as a driver of trust in a given exchange

situation (Poppo, Zhou, & Ryu, 2008). Secondly, while the primary role of "gaming" is in the exploration and probing of the other parties (e.g. with regard to what level of relational norms it can be possible to achieve), reciprocity is more targeted at actually building relational norms and trust in its two forms, credibility and benevolence (Ganesan, 1994). It shows to the other party the readiness to sacrifice some immediate gains with an implicit or explicit expectation for reciprocation in future. Reciprocal behaviour is especially beneficial for building relationships if "giving" and "taking" have asymmetric value, so that a sacrifice by one party has a higher weight as a gain for the other party.

Reciprocal behaviour is a competence Ronald seemed to lack in Exchange Episode II. If he had chosen to withdraw or constrain his claims for the shafts price increase in the very beginning of the dispute, the outcome of the price renegotiation might have been more favourable for ConCo (as Frank hinted).

At the same time Bobby was able to secure more understanding with regard to change orders for InCo by deliberately taking an easy stand on certain shortcomings in the installation specifications made by Installation Advisors Co.:

> *Bobby: "I have to work with a different group of people every year or two years, so after two months you know a lot about how people work. And if he [a person] is important for you, you have to agree with him a bit, because he does determine if you get your money or not. That is, I think one of the most important attributes of a project leader, that is that you have knowledge about the people; that you can see how somebody at the other side of the table is working. It is easiest to burn him to the ground, but if that is the person who decides whether you do or don't get your money, then you are doing that at the wrong person. Well, a lot of people do not understand this very well…"*

> *Bobby: "Meerwerk in our case often is the result of a mistake of the advisor. When we solve this problem for them, we expect a flexible attitude of the advisor in cases of meerwerk."*

We argue that the competence of reciprocity promotes all three dimensions of relational norms. Information exchange and flexibility are enhanced, as the other party is expected to reciprocate in providing valuable information and reacting to the counterpart's requests. Solidarity is strengthened by increasingly relating the individual efforts of one party to the realization of the other party's goal in the exchange.

Our findings on the importance of reciprocity as a relational exchange competence of boundary spanners are in line with Hornby et al (2000), who emphasize the value of reciprocity that manifests itself in: "respect and concern for the individual, gives value to mutual understanding and the building of mutual respect" (Hornby, Atkins, Beale,

Campbell, & Sanders, 2000: 160). At the same time, it should be noted that reciprocity can be a risky strategy to pursue, as it is based on an assumption that the other party will reciprocate in the future. Therefore, reciprocity involves some initial level of trust in the other party, and might be appropriate at a slightly later stage of relationship development in projects than "gaming", which is partly aimed at building such trust.

Proactiveness

Finally, the third relational exchange competence of the project managers consists in being able to act proactively in response not only to the immediate and obvious opportunities and challenges, but also to anticipate forthcoming challenges, bottlenecks and deviation from normal project routines. As demonstrated by Ronald in Exchange Episode III (delays), continually ignoring uncertainties about the forthcoming work (e.g. not checking the quality of the floor in the Clinic facilities in advance) leads to losing control of the plan and subsequent conflicts with the exchange counterparts:

> *Willem (Installation Advisors Co): "Their [ConCo's] price is too low. And he [Ronald] does not want to think what he has to do. He always says "Give the drawing and I do it". This is not thinking! He said "I keep all the drawing from the architect. Here's a change in the drawing. Is there everything in it? How high is the door? I do not see the height of the door. What must be the height of the door? Tell me, Mr [name of an employee of the Agency's Facility management department], how high is the door? Is it like that? Ok, I order it. I order this as you said to me"… He is not cooperative! It is a way of work, but it is not a good way and not a good attitude for this kind of projects."*

> *James: "He [Ronald] is hiding behind the rules".*

The discussion of proactiveness resonates with insights from Williams (2002): "A poor partner is perceived as one who slavishly or dogmatically ploughs a representative furrow in partnerships arenas and, irritatingly, has to "report back" everything to the home organisation. Conversely, the more effective partners are those who are empowered, within certain negotiated parameters, to engage constructively with other partners. They have a feel for what may or may not be acceptable to their home organisations and are ready to play the partnership game." (Williams, 2002) p. 120.

A Project manager's proactiveness is related to the relational norms of information exchange and flexibility, as a higher freedom of a boundary spanner to act on his own discretion enables him to share information more rapidly and be more flexible in response to the needs of the other party. Moreover, a proactive problem-solving ap-

proach helps achieve mutually beneficial (integrative) outcomes in negotiation situations (Pruitt & Lewis, 1975).

The value of being a proactive boundary spanner seems to be especially high in the face of uncertainties and contingencies, which are inherently prone to renegotiations and conflicts. By using his behavioural discretion to create and realize opportunities for regaining losses by acquiring extra work and optimizing work processes, a competent project manager can to some extent neutralize the effects of low prices without jeopardizing exchange relationships with the other project stakeholders or performance in the project itself.

5.7. Discussion

5.7.1. Propositions

In the above sections we have presented an inductive longitudinal case study of a construction project for which the contractors were selected by means of an online reverse auction. Based on the analysis of the empirical evidence, in this section we formulate propositions that can be tested in future studies. Also, here we discuss the findings and their implications, as well as the limitations of this study.

The first research question this study intended to answer is: *How do reverse auction outcomes affect the execution phase of auctioned contracts?* The empirical evidence revealed a two-fold effect of auction outcomes on the contractors' project managers. First, boundary spanners' constraints with regard to delivering high performance in the project are aggravated by the price resulting from the auctions, as project managers have to, on one hand, secure a profit margin or minimize losses for their own company and, on the other hand, need to accomplish the project with the budget, time and quality standards defined at the contracting stage. Therefore, our first proposition is as follows:

Proposition 1.1*. The lower the auction prices, the more boundary spanners' constraints are aggravated at the project execution stage.*

The second aspect of the auction effect is that due to the fixed price contract often associated with auctioning construction contracts (Bajari et al., 2006), boundary spanners' manoeuvring space in dealing with contingences during the execution stage (e.g. changes in governmental regulations or client requirements) are limited. Our second proposition regarding the effect of reverse auctions is:

Proposition 1.2. *Fixed price contracts associated with reverse auctions aggravate boundary spanners' constraints by reducing their manoeuvring space in dealing with project contingencies.*

It is important to note that whereas the effect of prices on project managers' constraints is likely to be similar regardless of the contract allocation form, e.g. also if the low price results from a negotiation, the effect of the fixed-price contract on the constraints is associated with auctions rather than with negotiations. This is due to the fact that, as the previous literature has revealed, in the construction industry negotiations are often (although not always) used along with cost-plus contracts, while auctions are associated with fixed-price contracts (Bajari et al., 2006). The underlying reason for this is that when complexity of the project is high and contractor's input might be needed already in the project design phase, the communication structure associated with auctions (i.e. when most of the information is transmitted in the form of bids rather than unstructured communication between the parties) stifles the information exchange necessary to deal with contingencies of complex projects (Bajari et al., 2006).

Another aspect of the present investigation is in revealing the relational exchange competences of project managers that enable them to alleviate at least some of the effects of role constraints. We attempted to answer the following research question: *What are the key relational competences of the boundary spanning individuals that influence the effect of the reverse auctions on inter-organisational relationships and project performance?*

In an effort to answer this research question we defined and elaborated on the nature and workings of the relational exchange competences of boundary spanners, namely gaming, reciprocity and proactiveness. The empirical evidence shows that a low level of these competences aggravates the effect of auction outcomes on project managers, while a high level of relational exchange competences help mitigate the effect of the constraints on relationships and performance. Therefore, we propose:

Proposition 2.1. *A high level of project managers' relational exchange competences of benevolent gaming, reciprocity and proactiveness mitigates the effect of role constraints on relationships and performance.*

Proposition 2.2. *A low level of project managers' relational exchange competences of benevolent gaming, reciprocity and proactiveness enhances the effect of role constraints on relationships and performance.*

More specifically, we attempted to investigate a connection between the level of relational exchange competences of project managers in terms of the relational norms they establish with the client's side and performance in the project. A positive rela-

tionship between a high level of relational exchange competences and relational norms became apparent. Reciprocal behaviour of project managers results in higher solidarity and flexibility; proactiveness leads to more information exchange; benevolent gaming can lead to a higher level of all relational norms. Consequently, boundary spanner's failure to perform at a high level of relational exchange competences creates damage to relational norms. The effect of relational exchange competences expresses itself in individual exchange situations and becomes reflected in the relational norms not immediately, but over time. Boundary spanners in our case study appear to be consistent in displaying high or low levels of relational exchange competences. Therefore, the next proposition is as follows:

Proposition 3.1. *Project managers' relational exchange competences of benevolent gaming, reciprocity and proactiveness positively affect the development of relational norms with their exchange counterparts.*

In addition we showed that the relational exchange competences are associated with a higher project performance in terms of quality and time (unfortunately, we did not have enough evidence to analyse the effect on the budget). We propose:

Proposition 3.2. *Project managers' relational exchange competences of benevolent gaming, reciprocity and proactiveness positively affect the performance in the project.*

Our results regarding the effects of relational exchange competences on relational norms resonate with the discussion of interimistic relational exchange (IRE). This is defined as "a close, collaborative, fast-developing, short-lived exchange relationship in which companies pool their skills and/or resources to address a transient, albeit important, business opportunity or threat" (Lambe et al., 2000). The term "interimistic" refers to the interim nature of relationships in such exchange situations. The exchange parties in IRE are able to develop relationships that are deeper than it is possible to achieve over a number of repeated individual transactions, but not as well-developed and sophisticated as in exchange situations that are close to the "relational" end of the continuum. The concept of interimistic relational exchange refers to many real-world exchange situations that are bounded by a relatively short and explicitly-defined lifespan, giving inter-organisational relationships less time to develop and mature than is typically assumed in evolutionary models of relationships development (Dwyer et al., 1987; Ring & Van de Ven, 1994). The lifespan of the exchange may be limited by the exploration of a business opportunity or duration of a project in which exchange parties are engaged. Expectations of future transactions are, thus, also limited compared to the traditional view.

Relational exchange competence is one of the antecedents of relational norms (flexibility, solidarity and information exchange) in IRE. Partners who possess relational exchange competence are believed to be able to develop relational norms more rapidly. Thus, relational exchange competence helps "shortcut the process necessary to establish the working norms necessary for functional IRE" (Lambe et al., 2000).

Our results contribute to the discussion of IRE in two ways. First, we inductively identify three distinct relational exchange competences that enable boundary spanners to quickly develop relationships with their counterparts. Secondly, we discuss how each of these competences relates to three relational norms (flexibility, solidarity and information exchange) between the parties. This way we make one step in the direction of the development of a non-evolutionary model of relationships development, a model for which Lambe et al (2000) call.

Another insight that emerges from our empirical findings is that relationships between each of the contractors and the customer's side seem to follow certain patterns which we, following some of the literature, call 'virtuous' and 'vicious' cycles (Sabherwal, 1999). In a virtuous cycle "each time partners act together they take a risk and form expectations about the intended outcome and the way others will contribute to achieving it. Each time an outcome meets expectations, trusting attitudes are reinforced." (Vangen & Huxham, 1998: 8).

A clear example of the virtuous cycle is the relationships between Bobby and the project owner's side. Bobby's strong relational competences allowed him to establish a high level of relational norms with the project owner's side, leading to higher trust and performance. InCo's good performance earned Bobby further credit in terms of trust and relational norms. This is how Bobby spoke about the project after the end of Phase One:

> *Bobby (InCo): I think this is an enjoyable job… Well, not like this [makes a "money" gesture], but the job in general I think it is pretty nice. Because the people of Architects Co, Ron, Frank and Jan, I can get along with them, I think they are nice people… For me that [getting along with people] is the foundation, because when you have to work with people you have to do something about that. Because [otherwise] you can be arguing all the time, like the contractor [Ronald] does, but that is too much for me.*

A vicious cycle starts with low level of boundary spanner's relational exchange competences, which results in a low level of relational norms. These lead to low credibility trust as well as benevolence trust, and low trust deteriorates performance.

The relationships between Ronald and the project owner's side provide an example of the vicious cycle. Before their trust in Ronald deteriorated, they had refrained from escalating the discussion to the director's level. However, after the long haggling

about the shaft's price and new reported delays, the Agency and Architects Co became less tolerant and resorted to applying pressure on Ronald. These developments are in line with the findings on the use of coercive strategy in inter-organisational relationships between architects and constructors in the construction industry elsewhere (Lui, Ngo, & Hon, 2006). The authors defined coercive strategy as "manipulation and reciprocation towards partners with an aim to influence their immediate actions", and found that the high level of both inter-organisational and interpersonal trust makes the use of coercive strategy less likely (Lui et al., 2006). This seems to explain why Architects Co and the Agency refrained from coercive actions until their trust in ConCo dropped considerably.

5.7.2. Implications and limitations

Our analysis has a number of managerial implications. A strategic aspect of this discussion is that complex projects, where the number of contingencies and threats to the normal project run is high and/or the price is low, require a very competent boundary spanner to be in charge in order to secure the success of such projects. In fact, we could see that this was understood by InCo:

> *Elliot (director of InCo): "In the procurement way [i.e. when projects are allocated via tenders and auctions] you can't build any relationships… So, within the job it must be as smooth as possible. So, you have to put on a project manager who is a master in every job, who is a master of working with all kinds of people, communicates with all types of people, and gets things done out of his knowledge and skills; has proven knowledge of what he is doing. Like Bobby, for instance… One of the strongest points about Bobby is that he can cooperate with many people. I have never heard anyone say: "Oh, no Bobby, I don't like to work with him". No one said it. We specifically chose Bobby for the job… Well, he can do a relational type of job but it [the relational job] is easier. And he can handle this [the Agency's project], on the edge of a business case, on the business side of the job, and stays cooperative within the project."*

Therefore, assigning a boundary spanner with an appropriate level of the relational exchange competences to IRE projects can be seen as a strategic choice that can be made in advance by a contractor's decision makers on the basis of the analysis of a project's properties, such as its complexity and risks.

One last aspect of the implications of our findings pertains to auction design. In the analysis of the auction outcomes we showed that a price/quality scoring winner selection rule enabled InCo to win bidding for Lot 2 (installation and maintenance of electro-technical equipment), retaining some financial slack due to its higher quality score over that of its closest competitor. One suggestion to improve this allocation rule based on our results would be to explicitly incorporate the quality of contractor's project manager, particularly the level of his/her relational exchange competences, in

the quality score. Although the relational exchange competence along the dimensions of benevolent gaming, reciprocity and proactiveness is surely hard to measure, years of project managing work experience and references from people who used to work together with the specific managers can serve as a basis for the evaluation. Such enhancement of the price/quality project allocation rule would allow companies with competent project managers who are better able to handle role constraints and various contingencies to have an advantage in bidding. By increasing the weight of project manager's competences in the price/quality scoring rule for projects with a higher level of anticipated uncertainty, the auction designer is able to create a mechanism that would enable allocation of complex and contingency-prone projects to more efficient contractors. As the literature from the field of multidimensional auctions suggests, this can also increase efficiency and Pareto optimality of auction outcomes (Koppius, 2002).

Finally, we discuss a number of limitations to the present findings. Being primarily a method for inductive research, an exploratory case study provides instruments and discovers data that can help lay the foundations of new theories. A downside of the method, however, is that it provides rather limited ways of discriminating between alternative explanations for the observed relationships. We recognize this limitation, and below we identify several explanations for our findings that have to be tackled by further research.

We have found four potential alternative explanations for the observed outcomes. The first alternative explanation for the difference in the project performance of ConCo and InCo and their relationships with the client's side can lie in the extent to which the two companies and the role constraints of Ronald and Bobby respectively, were affected by the auction outcomes. As we discussed in Section 5.5, there are two reasons to believe that InCo's profit margin in the project was less affected. First, due to the ratchet bidding strategy used by InCo, it had been able to bid higher than its marginal cost in the tender, even if (as InCo's director acknowledged), it had to give away in bidding for Lot 3 some of the slack gained in bidding for Lot 2. Second, a high quality score allowed InCo not to lower its bidding price as much as its opponents did. It looks plausible therefore, that the constraints faced by Bobby in executing the project were somewhat more relaxed than those faced by Ronald. This difference can potentially explain some of the variation in the performance and relationships, in addition to the difference in the managers' relational exchange competences.

Another explanation for the difference in the behaviour of Ronald and Bobby is the difference between ConCo's and InCo's contracts. Unlike the contract of ConCo, the two contracts won by InCo included 10-year maintenance provisions in addition to the main installation work. So, one could suggest that the more cooperative behaviour displayed by Bobby of InCo was a result not only of his superior relational exchange competences but of InCo's expectations to gain additional work from the client during the 10 years of maintenance. After all, a contractor who already knows a project, in particular its design, its client and the architect, is in good position "to es-

timate the likelihood of later design changes, the costliness of responding to them, and the likely reaction to a post-auction proposal to increase compensation in response to requested design changes" (Rothkopf & Harstad, 1994: 379). There is, however, a counter-argument to this alternative explanation. It stems from the fact that the maintenance part of the contract would have to be executed by a different company within InCo's large holding, InCo Maintenance. This company has a separate budget, making its performance only remotely related to that of InCo. Since Bobby and InCo's management were unlikely to directly benefit from potential additional work at the maintenance stage even if it occurred, it seems unlikely that the maintenance contracts provided Bobby with additional incentives to be more cooperative or relaxed his role constraints at the project execution stage.

The third explanation pertains to the difference in the complexity of the work executed by the two contractors and its effect on project performance. One difference between construction and installation work is that the former requires less expert knowledge to judge its progress and quality, on the face of it, than the latter. For example, for James of the Agency and Frank of the Architects Co it was easier to evaluate the quality of the walls and doorways made by ConCo just by looking at them than the quality and durability of air-conditioning and heating systems installed by InCo. As one of the respondents told us in an interview, "everybody could have an opinion" on the work done by ConCo. This lack of the visibility of InCo's work might have been a reason for its smoother relationships with the client's side than the ones ConCo had, and for the higher pressure on ConCo.

The fourth and final alternative explanation is related to the third one. The literatures on both boundary spanning and construction project management assign great importance to project managers' technical skills, e.g. relate them to boundary spanners' leadership and power (Fleming & Waguespack, 2007; Spekman, 1979). In our interviews several respondents, e.g. James of the Agency and Willem of Installation Advisors Co complimented the high level of technical expertise of Bobby and expressed doubts about that of Ronald. The level of technical expertise was difficult to objectively evaluate, especially because Ronald and Bobby had similar backgrounds and approximately the same relevant work experience. There is a possibility therefore that some of the variation of Ronald's and Bobby's performance and relationships with the client side stemmed from the difference in their technical skills rather than the difference in their respective constraints and/or relational exchange competences.

We propose that the limitations of the research method used in this study in dealing with alternative explanations should be overcome in further research that would enhance the maturity of the emerging theory. In particular, further survey-based cross-sectional studies can take into account and measure the level of role constraints and technical expertise, as well as account for the different types of work performed by contractors in construction projects. This will enable us to quantify the relative effects of these variables in addition to the effect of relational exchange competences on the relationships between parties and performance in projects.

5.8. Conclusions

This study has considered the impact of online reverse auctions on buyer-supplier relationships and performance during the execution stage of a construction project. We employed the theoretical perspective of organisational boundary spanning to 1) conceptualize and assess the impact of auctions on individuals in the boundary spanner roles during the project execution phase, and 2) investigate the relationship between the impact of auctions on boundary spanners and the performance in the project and identify boundary spanners' competences that can mitigate this relationship. The empirical study was designed in the form of a longitudinal inductive case study and performed in the context of the building construction industry, where it focused on the project managers from the contractors' side.

This investigation resulted in several findings and contributions to the literature. First, we found that during the project execution stage, the effect of auction outcomes on contractors' project managers is twofold. One aspect of auction impact is that the project managers' role constraints are aggravated by the prices resulting from the auctions because these project managers have to, on one hand, accomplish the project with the budget, time and quality standards defined at the contracting stage and, on the other hand, secure a profit margin or minimize losses for their own company. The other aspect of auction impact is that project mangers' role constraints were aggravated by the fixed-price nature of the contract associated with reverse auctions, which reduced their ability to deal with project contingencies at the execution stage.

Second, by building on behavioural patterns that emerged from the analysis of the empirical data, we identified three relational exchange competences that help contractor's project managers cope with their role constraints. These competences are benevolent gaming, reciprocity and proactiveness. We demonstrated that when the level of these competences was low, a project manager's role constraints had a considerable negative effect on his relationships with the client's side and on project performance. By contrast, a high level of the relational exchange competences enabled another project manager to overcome the effect of the role constraints, which resulted in cooperative relationships with the client side and good project performance.

These findings contribute to the bodies of knowledge on the effect of online reverse auctions on buyer-supplier relationships, as well as knowledge on the nature and role of the skills of boundary spanners and construction project management. The literature on online reverse auctions benefits from the new insights into how the impact of auctions spreads throughout the execution stage of auctioned projects, whereas previous investigations were limited mostly to the investigation of the immediate effects of reverse auctions on buyer-supplier relationships.

The contribution to the literatures on boundary spanning and construction project management consists in identifying three relational exchange competences of con-

struction project managers and explaining their role in mitigating boundary spanners' role constraints and their effects on relationships with their exchange counterparts and project performance.

There are also important managerial implications of the findings produced by this study. First, boundary spanners with strong relational exchange competences seem to be better positioned to cope with the complexities and uncertainties of construction projects. Therefore, assigning a boundary spanner with an appropriate level of relational exchange competences to projects where there is a high level of uncertainty is a strategic choice that can be made in advance by decision makers on the basis of the analysis of project characteristics. This is in line with the insight of Aldrich et al. (1976) that abilities of boundary spanners are a critical differentiator in heterogeneous environments characterized by high pressures and contingencies.

Second, we suggest that the design of reverse auctions for projects, where uncertainty and contingencies are expected (such as the one featured in the present study), could incorporate a price/quality award role where some weight is allocated to the skills of the project managers, particularly their level of the relational exchange competences. This would allow companies with competent project managers to have an advantage in bidding for complex projects.

Further research into the impact of reverse auctions during the project execution stage and the effect of boundary spanners' relational exchange competences, in addition to the theory-testing directions already outlined in the discussion section, should focus on establishing the generalization of the present findings in other industrial contexts where reverse auctions are taking root, e.g. in the IT services industry, as we discussed in Chapters 2-4.

To conclude, we mention two other limitations to the findings. The first one concerns the richness of the data collected in the course of the case study. This limitation comes from the fact that most of the interviews were conducted in English, which was not the native language either of the respondents or of the interviewers. Some nuances of the case might have escaped our attention due to this factor. Another possibility is that an even more refined model of relational exchange competences could have resulted from an ethnographic study, which would have allowed the observation of the behaviour of participants on a daily basis, thus ensuring better capturing of behavioural nuances and outcomes.

The second limitation deals with the focus of this study, constrained limited to the effect on, and the relational exchange competences of, one specific type of boundary spanner in the construction projects - contractors' project managers. Future studies will hopefully be able to more fully explain the variation in the parties' relationships and project performance by simultaneously taking into account competences of boundary spanners on contractors' as well as on the client's side, e.g. architects who manage the project on behalf of the client.

Appendix Chapter 5

Table 5-3. Empirical studies of inter-organisational relationships in online reverse auctions.

Study	Focus	Method and context	Relational aspects investigated	Key findings and conclusions regarding relational aspects
(Van Tulder & Mol, 2002)	The effects of trade-offs in sourcing strategy on reverse auctions.	Single case study into commoditized direct materials procurement by a medical equipment manufacturer.	Buyer-supplier relationships.	Application of reverse auctions is limited to market, rather than hierarchical settings.
(Smart & Harrison, 2003)	The effects of reverse auctions on price level and buyer-supplier relationships.	Six exploratory case studies into reverse auctions for non-strategic products in several industries	Willingness to take part in further auctions.	No serious negative impact on buyer-supplier relationships found. Reverse auctions can be effectively used both in competitive and collaborative settings.
(Bartezzaghi & Ronchi, 2003)	The objectives of the companies adopting internet procurement tools; purchase characteristics; buyer-supplier relationships and strategies.	Four exploratory case studies in several industries.	Buyer-supplier relationships.	Reverse auctions can destroy prior close buyer-supplier relationships, replacing them with arm's-length relationships. Auction winner might be less cooperative in solving problems.
(Jap, 2003)	The effects of reverse auctions on buyer-supplier relationships.	Interviews and quasi-experiment with 68 suppliers in automotive industry.	Supplier's opportunism suspicion. Supplier's willingness to make idiosyncratic investments.	The increase in supplier's opportunism suspicions before and after the auction is greater in open-bid than in sealed-bid auction for both incumbent and new suppliers. In sealed-bid auctions supplier's willingness

				to make idiosyncratic investments before and after the auction increases, while in open-bid auctions it does not change. Incumbent suppliers increase their willingness to make idiosyncratic investments to match that of new suppliers so that no difference exists post-auction.
(Emiliani & Stec, 2004)	Suppliers' reaction to reverse auctions; the effects of reverse auctions on suppliers' business policies and practices.	Survey of 23 suppliers in the US aerospace industry.	Supplier retaliation. Suspicions of opportunism. Opportunistic behaviour.	Suppliers seek to retaliate by increasing their prices. Buyers are seen as opportunistic by suppliers, which ignites similar behaviour in suppliers.
(Wang & Archer, 2004)	Choosing appropriate online marketplace functionality for procurement transactions.	Five case studies of online marketplaces.	Buyer supplier relationships: short-term (adversarial, arm-length) versus long-term (co-operative, based on trust, etc).	Reverse auctions are applied both in short-term and long-term relationships, the latter being characterized by high non-contractibility, asset specificity and complexity of description.
(Dani et al., 2005)	Development of a conceptual framework for studying and understanding buyer-supplier behaviour in reverse auctions.	Interviews, unspecified industry.	Buyer and supplier behaviour across a series of reverse auctions.	Buyer and supplier representatives demonstrate unethical and game-like behaviour, aiming at "winning at all costs" and obtaining a powerful position.
(Pearcy & Giunipero, 2006)	The effects of reverse auctions use on a) price reduction and b) governance structure of buyer-supplier relationships.	Survey of 142 purchasing managers in different industries and academics.	Governance structure of buyer-supplier relationships ("bid-and-buy" vs "developing/maintaining the long-term relationships").	Use of reverse auctions for buying customized direct materials can be associated with developing/maintaining the long-term relationships.
(Tassabehji et al., 2006)	The effects of reverse auctions on supplier-buyer	Five case studies and 16 interviews with	Suppliers' suspicion of buyer's opportunism.	Supplier-buyer relationships change negatively as a result of reverse auctions. Suppliers

	relationships.	suppliers in the packaging industry.	Suppliers' willingness to share future saving resulting from technological improvements. Suppliers' discontent with certain practices.	become unwilling to share future savings (from innovations) with buyers and might be willing to retaliate. Incumbent suppliers' attitude to the buyer may worsen regardless of whether the supplier loses the business. Suppliers are discontented with bidder qualifications and suspicious of phantom bidding, exploitation of incumbents, lack of clarity and completeness of product specifications.
(Zhong & Wu, 2006)	Suppliers' bidding behaviour and its impact on auction outcome; the effects of non-price supplier attributes on bidding behaviour and on auction outcome.	Exploratory statistical analysis of transaction data from 64 auction events conducted by one buyer in high-tech industry.	Supplier's incumbency.	Prior buyer-suppliers relationships are rewarded in awarding contracting in new auctions. Incumbent suppliers are three times more likely to win a contract than new suppliers. As winners of reverse auctions, incumbents provide buyers with less cost savings than new suppliers.
(Radkevitch et al., 2006c)	Use of reverse auctions and bilateral negotiations in procurement of IT services across multiple projects.	Exploratory statistical analysis of 104 portfolios of buyer-supplier relationships from an online marketplace for IT services.	Duration of buyer-supplier relationships. Share of one supplier in buyer's portfolio of projects. Buyer's satisfaction with the supplier.	In buyers' portfolios of projects, reverse auctions are associated with short-term relationships while negotiations support long-term relationships. Buyers in different clusters use the two mechanisms in combination to a different extent. Buyers using predominantly negotiations are more satisfied with their suppliers than buyers using predominantly reverse auctions.
(Jap, 2007)	The effect of reverse auction design and bidding parameters on buyer-supplier relationships from	Twenty-five quasi-experiments involving 125 suppliers from four industries.	Supplier's opportunism suspicion. Supplier's expectation of continuity.	The number of bidders increases suspicion of opportunism. Increasing the number of bidders up to approximately 12 positively affects supplier's satisfaction.

	suppliers' perspective.		Supplier's overall satisfaction.	The higher the contract volume, the higher is the satisfaction and continuity expectations. Having 6-7 lots in an auction leads to a decrease of opportunism suspicions and increases continuity expectations. In auctions with partial price visibility (ranks), overall satisfaction is higher. Having more bidders as well as having too few or too many lots increases opportunism; using auction-award rule in combination with fully visible price raises suspicions of opportunism. Greater price drops lead to less satisfaction.
(Gattiker et al., 2007)	The effect of different communication media on the level of suppliers' trust in procurement negotiations.	Six experiments involving 139 "suppliers".	Honesty trust. Benevolence trust.	Face-to-face negotiations result in higher post-treatment trust than email negotiations in low procurement complexity situations, but show no difference under high complexity. Email is higher in post-treatment trust than auctions in high complexity situations but equal in low complexity situations. Auctions are always lower on trust than face-to-face negotiations. These findings hold for both benevolence and honesty trust. Procurement complexity-wise: face-to-face negotiations are always high on trust. Email is higher on trust in high complexity situations. Auctions are better on honesty trust at low level of procurement complexity. Supplier's post-treatment honesty trust is positively associated with his desire for future

				dealings.
(Pearcy et al., 2007)	The effect of the relative strategic importance of buyer-supplier relationship on relational governance in the usage of reverse auctions. The effect of relational governance on supplier cooperation, price and time reduction.	Survey of 142 purchasing managers in different industries and academics.	Strategic importance of existing buyer-supplier relationship. Governance structure of buyer-supplier relationships ("bid-and-buy" vs "developing/maintaining the long-term relationships").	When buyer-supplier relationships have a high strategic importance in the use of reverse auctions, relational governance mode is likely; this leads to higher supplier cooperativeness, but is negatively associated with price and time reduction.
(Jap & Haruvy, 2007)	The effect of supplier's relationship propensity prior to the auction on bidding aggressiveness. The effect of bidding aggressiveness on buyer-supplier relationships after the auction.	Longitudinal survey of 12 online reverse auctions across several product categories.	Suppliers' disposition toward developing a relationship; supplier's satisfaction with the relationship.	Number of competitors' bids increases bidding aggressiveness. Incumbency, number of bidders, and willingness to make relationship-specific investments decrease bidding aggressiveness. Bidding aggressiveness leads to a lower suppliers' disposition toward developing a relationship and also decreases incumbent supplier's satisfaction with the relationship.
(Radkevitch et al., 2008)	The effect of prior exchange interaction, buyer's experience and satisfaction with vendor's performance on buyer's choice between reverse auctions and bilateral negotiations as an allocation mechanism for IT services contracts.	Statistical analysis of longitudinal transaction data (2,081 IT projects of 91 buyers) from an online IT services marketplace.	Buyers' past exchange interaction with vendors.	Prior repeat interaction with vendors favours the use of negotiations over auctions in the next transaction. The need to explore the marketplace due to buyer's inexperience and dissatisfaction with vendor's performance in the most recent project lead to the use of auctions instead of negotiations.

Chapter 6. Conclusions of the Thesis

We have conducted four empirical studies that use quantitative as well as qualitative empirical research methods to investigate factors affecting the usage and outcomes of online reverse auctions for services as well as the relationships between the parties involved in such auctions.

This last chapter of the thesis starts with a discussion of the findings of the four empirical chapters in the light of the three problem areas identified in Chapter 1: auction context, service characteristics, and buyer-supplier relationships in reverse auctions. We continue by reviewing the managerial implications for auction stakeholders, and by discussing the main limitations of the findings and the possible directions for future research.

6.1. Reflections on the Findings

As we argued in Chapter 1, the three problem areas that inspired this research are inherently intertwined. The characteristics of the services are related to the auction context, i.e. stages and aspects of the procurement process and actors' behaviour before auctions (such as choosing the allocation mechanisms), during auctions (e.g. taking measures to reduce the costs of evaluating bids) and after auctions (executing the contract). Similarly, service characteristics are related to buyer-supplier relationships, because the nature of service contracts often requires buyers and suppliers to interact during the contract execution stage. The subsequent discussions of the findings arranged around the three problem areas are closely interconnected and often pertain to more than one problem area.

6.1.1. Reverse auctions and their context

One of the cornerstones of the discussion in Chapter 1 was a perceived gap between what some researchers call two "worlds" (Elmaghraby, 2007) – the world of academic models of auctions and the business world in which auctions exist amid a great variety of business practices, rules and behaviour (Jap, 2002; Rothkopf & Harstad, 1994; Smith, 1990). We would like to recall a quote from Rothkopf and Harstad (1994) that summarizes the rationale underlying this gap: "Behaviour in auctions will tend to be altered by the context in which the auctions arise. Furthermore, the outcome of competitive bidding will typically affect economic relationships external to the market in which the transaction occurs." (Rothkopf & Harstad, 1994: 364).

This dissertation has taken a step towards bridging this gap between the two "worlds". The efforts towards that end, on the one hand, have been based on the solid ground of academic theories (auction theory, contract theory, transaction costs theory). On the other hand, they have relied on an analysis of a broad variety of empirical evidence relating to auction-driven transactions from two contexts: online marketplaces for IT services and building construction projects. The variety of context-specific factors that frame the use and outcomes of reverse auctions is impressive – from the specific designs of allocation mechanisms and functionality of online marketplaces to EU regulations determining when specific allocation mechanisms can be used and municipal regulations affecting certain important elements of already-auctioned construction projects. Our analyses have brought more clarity into how these contextual factors affect actors' behaviour before, during and after the reverse auctions, as well as into the outcomes of auctions and auctioned contracts.

In **Chapter 2** we looked at the part of the procurement process that takes place *before* auctions on an online marketplace for IT services. We identified and quantified the effect of the buyer's *prior* repeat exchange interaction with vendors on the choice of allocation mechanism in the buyer's next transaction. We found that prior exchange interaction greatly increases the propensity of the buyer to negotiate, rather than to use an auction, with a given vendor. However, in cases when the buyer needs to explore the supply landscape in the marketplace or when the buyer is dissatisfied with the vendor's performance in the most recent project, the use of auctions in the subsequent project becomes more likely. Chapter 2 also contributes to the body of literature on allocation mechanism choice (Bajari et al., 2006; Corts & Singh, 2004; Goldberg, 1977; Kalnins & Mayer, 2004). Until now the literature has considered only discrete exchange situations, ignoring the historical context in which exchange occurs (Bajari et al., 2006; Bonaccorsi et al., 2000; Leffler et al., 2003; Manelli & Vincent, 1995). This represents a considerable gap for both theory and practice, which has been bridged by our study.

In **Chapter 3** we identified five distinct tactics that buyers can use *during the preparation for* and *bidding at auctions* to manipulate the level of costs incurred when evaluating vendors and vendor bids in online auctions for IT services, namely search (for the vendor), RFP preparation, budget announcement, negotiation, and bid filtering. 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. We also studied how the effectiveness of the cost-reducing tactics changes as buyers gain experience in transactions on the online marketplace. 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 the allocation likelihood, at the same time buyer experience decreases the effectiveness of RFP preparation. Overall, in Chapter 3 we have extended and tested the theory on the effects of evaluation costs on the outcomes of transactions in the online environment (Carr, 2003; Snir & Hitt, 2003). While most previous studies have treated evaluation costs as an exogenous

factor, this study considers them endogenous. This study contributes to the electronic markets literature by providing empirical support to theoretical reasoning on costly bid evaluation, by testing the direct implications of existing models (Carr, 2003; Snir & Hitt, 2003). This is important because the "record of direct application" of many key models is typically weak (Barua et al., 1997). By testing some of the direct conclusions of the evaluation cost models, this study helps further to link analytical auction-theoretical models with the business context in which online auctions occur.

Further, in **Chapter 5** we analyzed how auction outcomes affect the project execution in the building construction industry *after* auctions take place. As the findings of Chapter 5 are also relevant to the two other problem areas – service characteristics and buyer-supplier relationships – we address them in detail in the next subsections.

Our results show that focussing on the broad context of reverse auctions for services helps understand actors' behaviour and auction outcomes. Taken together, these results emphasize the value of undertaking further efforts targeted at embedding auction research within the empirical contexts, and also demonstrate the rewarding results of such efforts.

6.1.2. Procurement of services

Services possess a number of characteristics that have implications for the use and outcomes of auctions, including complexity, information asymmetry, and interaction between buyers and vendors during service delivery (Lovelock, 1983; Richmond et al., 1992; Snir & Hitt, 2003). We obtained interesting insights regarding the implications of these characteristics for auction use, actors' behaviour, and auction outcomes.

We found in **Chapter 2** (as already discussed above) that experienced buyers of IT services who are satisfied with the performance of their past projects prefer to negotiate their next projects with their incumbent vendors (which is likely to be related to the cost-reducing effects of learning, idiosyncratic investments and relational norms, which are important in the case of IT services), while new or dissatisfied buyers choose to auction their projects. However, the insights of **Chapter 5** suggest that other factors can also affect the use of auctions. Although the literature warns against the use of auctions for allocating complex projects (Bajari et al., 2006; Goldberg, 1977), in practice there are situations when this inevitably occurs, e.g. when regulations prevent state or municipal organisations from resorting to alternative mechanisms such as negotiations. When this is the case and contingencies are expected during the project execution, we found that the difference for the relationships between the parties as well as for the performance in the project can be made by the boundary spanning individuals who manage project execution on a day-to-day basis. This finding is likely to hold true not only for the building construction industry but for other fields where services are complex and interaction is intense, such as customised software development.

Further, **Chapter 4** showed that buyers on online IT service marketplaces have a number of different ways to organize their procurement. We identified four clusters of portfolios of exchange relationships – Transactional buyers, Recurrent buyers, Small diversifiers and Large diversifiers – that possess distinct mixes of exchange relationships, exchange mechanisms and transaction characteristics. Transactional buyers prefer arm's-length relationships and tend to switch suppliers often, while Recurrent buyers develop longer and closer exchange relationships with incumbent suppliers. The two other clusters, Small and Large Diversifiers, do not show such strong preferences either for arm's-length or for recurrent exchange or for any exchange mechanism. With regard to the exchange mechanism use the picture is also quite diverse: while Relational buyers mostly prefer negotiations and Recurrent buyers mostly stick to reverse auctions, buyers in the two other clusters seem to use both exchange mechanisms to a comparable extent. The high level of buyer experience across different portfolios indicates that they are not simply intermediary stages of the evolution of one single portfolio type but rather deliberate stances defined by the inherent intention of different buyers to pursue specific exchange relationship strategies.

Service characteristics also play a significant role in **Chapter 3**. We found that when idiosyncratic and customizable services are concerned, and evaluating vendors' bids is inherently costly, buyers have ways to decrease their bid evaluation costs by manipulating their behaviour and applying what we call evaluation-cost-reducing tactics. These tactics enable buyers to better control their costs and increase the project allocation likelihood.

The contributions of the above insights from different chapters into how service characteristics are related to the use of reverse auctions, the behaviour of actors within auctions and auction outcomes pertain to several research areas: the role of bidding and bid evaluation costs on online professional service marketplaces (Carr, 2003; Snir & Hitt, 2003), the role of product (service) complexity in the choice of allocation mechanism (Bajari et al., 2006; Bonaccorsi et al., 2000; Leffler et al., 2003; Manelli & Vincent, 1995), the heterogeneity and behaviour of actors in online marketplaces (Bapna et al., 2004) and the research into buyer-supplier relationships in reverse auctions (Gattiker et al., 2007; Jap, 2003; Jap & Haruvy, 2007).

Overall, although we believe that such context-specific effects of service characteristics can be to some extent generalized to other settings, it is very probable that other contexts contain numerous examples of different context-specific actor behaviour, and further research into these contexts will produce many valuable contributions for both theory and practice.

6.1.3. Reverse auctions and buyer-supplier relationships

In Chapter 1 we highlighted a discussion in the literature on whether or not close buyer-supplier relationships can co-exist with the use of reverse auctions by the buy-

ers (Emiliani, 2004; Jap, 2002; Pearcy et al., 2007). Our findings provide diverse insights into this subject.

Chapter 2 and **Chapter 4** looked at how buyers used reverse auctions and, at the same time, how they used vendors for repeat business. The studies used very different research approaches and, on the face of it, produced results that may seem contradictory. Chapter 2 found that IT service buyers avoid using reverse auctions with their established vendors unless they are not satisfied with the vendor performance (new buyers, having no established vendors, are more open towards reverse auctions). Chapter 4, however, revealed the existence of buyer types that recurrently use the same vendors but also use reverse auctions. The contradiction here is not a real one, as Chapter 2 looks at individual transactions while Chapter 4 analyses the entire portfolio of exchange relationships. It is likely that buyers who rely heavily on auctions in their first steps in the marketplace or switch vendors at some point of their transaction history appear to predominantly use negotiations when looked at from a portfolio perspective that covers several years of transaction history.

The investigation of buyers' portfolios of exchange relationships in Chapter 4 also showed that reverse auctions are associated with short-term, arm's-length exchange relationships, while bilateral negotiations support longer-term, recurrent exchange relationships that display non-contractible elements of exchange. On the one hand, this supports some of the existing studies on reverse auctions that have reached similar conclusions (Emiliani & Stec, 2002; Van Tulder & Mol, 2002). On the other hand, our findings are in line with studies that consider online reverse auctions appropriate for supplier screening and initiating long-term exchange (Elmaghraby, 2007). It is likely that reverse auctions are used by Recurrent buyers, as already noted above, to initiate recurrent relationships with preferred suppliers.

All in all, our findings suggest that, with established vendors and when the level of relational norms with the vendor is high, buyers are reluctant to use reverse auctions. Buyers on the online marketplace for IT services seem to avoid using auctions "as a wake-up call for their incumbent supply base", unlike some previous studies suggest (Jap, 2002). Also, when complex projects are auctioned, auction outcomes in combination with project contingencies are likely to place a strain on relationships during the execution stage (**Chapter 5**). All this does not provide a simple answer to the debate in the literature, but it does make the picture more nuanced and complete.

Another interesting insight from Chapter 5 is that even within the same construction project and with the same buyer different contractors can have different relationships, from cooperative to non-cooperative. We identified three relational exchange competences that can make a difference between cooperative and non-cooperative relationships: benevolent gaming, reciprocity, and proactiveness. We demonstrated that when the level of these competences was low, the project manager's role constraints had a considerable negative effect on his or her relationships with the client's side and on the project performance. By contrast, a high level of relational exchange competences enabled another project manager to overcome the effect of the role constraints,

which resulted in cooperative relationships with the client side and good project performance.

These findings contribute to the bodies of knowledge on the effect of online reverse auctions on buyer-supplier relationships (Emiliani, 2004; Jap, 2002; Pearcy et al., 2007), as well as to the knowledge on the nature and role of the skills for the literature on both boundary spanning and construction project management. The literature on online reverse auctions benefits from the new insights into how the impact of auctions spreads throughout the execution stage of auctioned projects, whereas previous investigations were limited to the investigation of the immediate effects of reverse auctions on buyer-supplier relationships (Gattiker et al., 2007; Jap, 2007). The contribution to the literatures on boundary spanning and construction project management (Aldrich & Herker, 1977; Loosemore, 1999; Lysonski & Woodside, 1989) consists in identifying three relational exchange competences of construction project managers and explaining their role in mitigating boundary spanners' role constraints and their effects on relationships with their exchange counterparts and project performance.

6.2. Summary of Managerial Implications

We studied reverse auctions in two contexts that belong to two different industries: online marketplaces for IT services and public tenders for building construction projects. Consequently, some of the managerial insights resulting from the four studies are context-specific, while others can be generalized across contexts. The managerial insight for different stakeholders and contexts are summarized in Figure 6-1 and discussed in detail below.

6.2.1. Implications for market-makers and auction designers

First of all, we suggest that the bidding outcomes of auctions and the execution stage of auctioned building construction projects (as well as IT projects) can benefit from the adjusted auction design that we suggest in Chapter 5. We suggested that the design of reverse auctions for projects, in which uncertainty and contingencies are expected (such as in the one featured in the present study) can incorporate a price/quality award rule with some weight allocated to the project managers' skills, particularly the level of the relational exchange competences. This would allow companies with competent project managers to have an advantage in bidding for complex projects. This is likely to be applicable to IT projects (e.g. custom software development) and building construction projects, which are particularly prone to contingencies at the execution stage (Kern et al., 2002) and the role of the vendor's project manager and his/her skills is very important (Levina & Vaast, 2005).

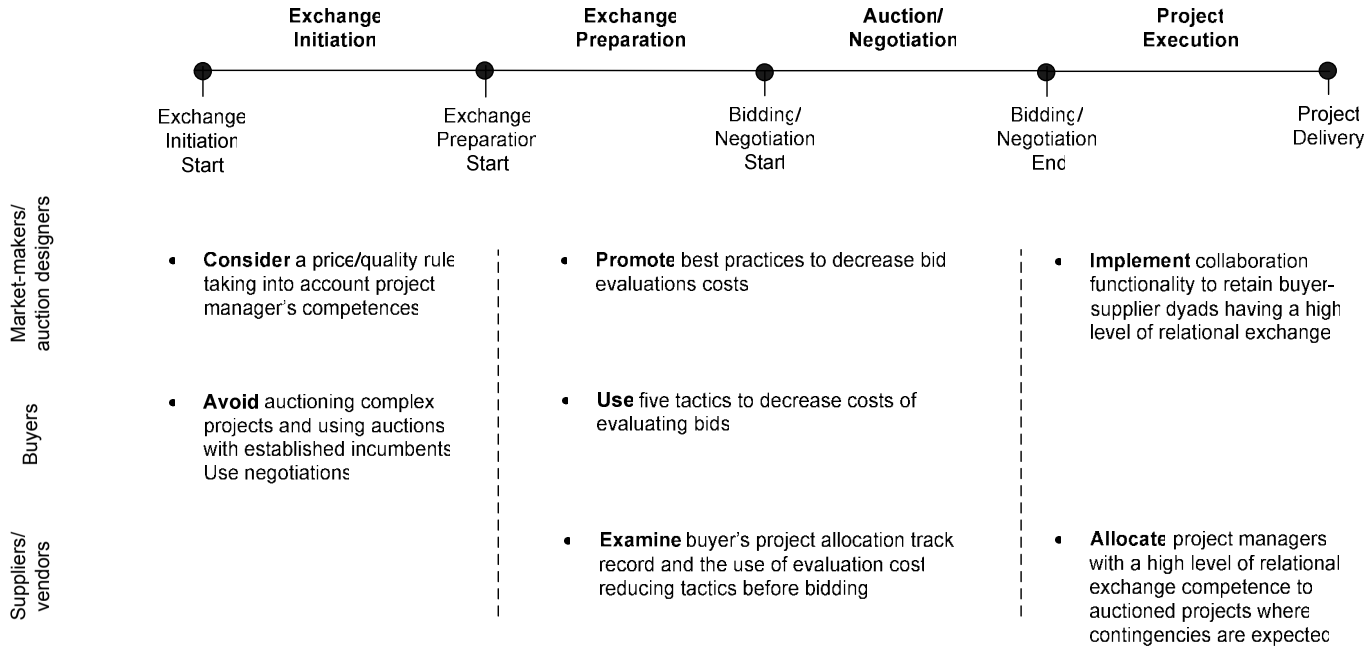

Figure 6-1. Summary of managerial implications per auction stakeholder and procurement stage.

Two other insights are more relevant to the context of the online IT services marketplace. The first of these insights concerns the reduction of buyer's bid evaluation costs (Chapter 3). Since market-makers benefit from the buyer's ability to decrease evaluation costs (which drives up the number of allocated projects) by earning more commission fees from realized projects, it is in their best interests to 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.

Another insight comes from Chapter 4, where our exploratory analysis identified four clusters of repeat buyers of IT services. The presence of a large cluster of Recurrent buyers can have far-reaching consequences for the online marketplaces. As the reliance on non-contractible elements of exchange (e.g. trust, reciprocity, etc) increases, recurrent relationships can gradually evolve into even closer forms of exchange such as relational contracting (Ring & Van de Ven, 1992). For an online marketplace such as the one investigated in Chapter 4, this means that buyers in relational dyads would experience less need for the mechanisms of formal governance (e.g. formal terms and conditions, arbitration, rating systems), as it comes at additional cost, and at some point the buyer might choose to abandon the marketplace to avoid service fees. We suggest that to prevent relational dyads from leaving, online marketplaces need to specially cater for close buyer-supplier relationships. They must address the key characteristics of such relationships, such as their longer-term nature, intensive information exchange, and accumulation and re-use of knowledge, e.g. by providing more value-added, collaboration-oriented functionality to support project execution, learning, information exchange and communication between long-term partners.

6.2.2. Implications for buyers of services

The results of Chapter 2 suggest that buyers who are satisfied with their incumbent vendors avoid using reverse auctions. The two groups who opt eagerly for reverse auctions instead of negotiations are new buyers (who, apparently, want to explore the marketplace by having a number of suppliers compete for their projects) and buyers who are unhappy with the performance of their incumbent suppliers. Unlike what one previous study suggests (Jap, 2002), buyers on the online marketplace for IT services seem to avoid using auctions "as a wake-up call for their incumbent supply base".

Also, Chapter 5 suggested that auctioning complex construction projects, can lead to problems with the performance and inter-organisational relationships during the realization of the projects, in case market conditions and other factors lead to low contract prices.

Once a buyer decides to start a reverse auction, the buyer should keep in mind the five tactics that are likely to help decrease the bid evaluation costs to successfully allocate their project. 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 (Carr, 2003). This leads to smaller overall efficiency loss in the sourcing process. Such an increased buyer ability to cope with evaluation costs and take contracting decisions is beneficial for vendors, too.

6.2.3. Implications for suppliers of services

According to the analysis in Chapter 5, boundary spanners with strong relational exchange competences are better positioned to cope with the complexities and uncertainties of construction projects. Therefore, assigning a boundary spanner with an appropriate level of relational exchange competences to projects with a high level of uncertainty is a strategic choice that can be made in advance by decision-makers, on the basis of the analysis of project characteristics. This is in line with the insight of Aldrich et al. (1976), that abilities of boundary spanners are a critical differentiator in heterogeneous environments characterized by high pressure and many contingencies.

We suggest that this conclusion is also likely to hold for complex IT services projects, where boundary spanning between organisations is a critical factor for their collaboration and performance (Levina & Vaast, 2005).

Finally, one implication for the vendors of IT services on marketplaces such as Elance and RentACoder is that before committing to bidding in auction they should pay attention to the buyer's track record in terms of awarding/ not awarding previous projects, as well as to the steps a given buyer is taking to reduce its evaluation costs. This can help vendors develop heuristics and avoid bidding for projects that have low chances of being awarded.

6.3. Limitations

We have already extensively discussed the limitations of the four individual studies of this thesis in the four respective empirical chapters. In this section we briefly go through these limitations once again, by discussing first the limitations that deal with the focus, assumptions and operationalization of constructs in the individual studies, and then more general ones that have to do with the methods and the type of data used in the thesis.

In this thesis we utilized two main types of data – transaction records from an online service marketplace and qualitative data obtained in a longitudinal case study – to test and develop theories that are rooted in a number of theoretical perspectives, such as transaction costs theory, auction theory, contract theory, organisational perspective of boundary spanning, and others. A distinct theoretical focus of each of the four studies led to a situation in which constructs and data had to be matched in a unique combination, appropriate for a given deductive or inductive empirical exercise. Consequently, most of the limitations are specific to the individual chapters.

A key limitation of Chapter 2 *"Choosing between Auctions and Negotiations in Online Markets for IT Services"* is that we cannot fully compare the effects of prior relationships on the allocation mechanism choice to factors identified by prior studies, such as contract complexity (Bajari et al., 2006). The measures for complexity available at our marketplace lack the refinement necessary for drawing such conclusions.

In Chapter 3 *"Coping with Costly Bid Evaluation in Online Markets for IT Services",* the hypotheses 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 in Chapter 3 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 in the online marketplace. Indeed, we only trace the presence of invited vendors at an auction and references to 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 be expected to be stronger, rather than weaker.

In Chapter 4 *"Heterogeneity of Buyer-Supplier Exchange Relationships in Online Markets for IT Services",* a considerable limitation is that the nature of the online marketplace did not provide an opportunity to collect systematic data on non-contractible attributes of exchange relationships. In addition, in this chapter we focus only on online exchange relationships, although they might provide an incomplete picture of buyers' exchange activities: future studies should extend the scope by gathering and analyzing data on offline exchange relationships along with online relationships.

In Chapter 5 *"The Impact of Reverse Auctions on the Execution of a Construction Services Project",* which is another inductive study, we identify several rival explanations to some of our findings that should be dealt with in further research that would enhance the maturity of the emerging theory. In particular, further survey-based cross-sectional studies could take into account and measure the level of role constraints and technical expertise, as well as account for the different types of work performed by contractors in construction projects. Two other specific limitations of Chapter 5 are related to the use of the English language, non-native for both the researchers and the respondents, and to the focus of the study, constrained to contractors' project managers. One of the suggestions for future research in Section 6.5 deals specifically with this latter issue.

The final issue to be discussed here is the limitations of the case study research method, which we employed in Chapter 5. A key criticism of the case study research method is believed to be the limited generalizability of its findings to other empirical settings, which case study theorists rebuff by arguing that it is not a goal of case study research to achieve statistical generalizations; rather, the goal is the generalizability to

theory (Lee, 1989; Yin, 2002). Having conducted an inductive case study, we regard its findings as a first step in theory building, which requires further development, refinement, and testing by deductive methods. We discuss these and other directions of research in the next section.

6.4. Generalizability Issues

A theory that lacks generalizability lacks usefulness (Lee & Baskerville, 2003). In this subsection we discuss issues related to the generalizability of our findings. More specifically, we discuss issues that are relevant to all theories developed in this thesis in general, rather than specific generalizability issues applicable to individual research projects. The latter have been addressed in the individual chapters. Similarly, we do not discuss here a process used to ensure theoretical generalizability of the case study findings – the details on that can be found in section 5.4.

The theory development process in this thesis relied on stylized facts and data from two empirical settings: online marketplaces for IT services and tenders in the building construction industry. The theoretical findings should be generalized with caution beyond these areas. There are several aspects of generalizability that we explicitly address here: generalizability for large project sizes, different online markets and different types of services.

Project size. Our findings were obtained with the data from a marketplace that consists of small and medium companies as well as freelancers. The average size of the contracts we studied is much smaller than the size of typical B2B software development contracts. As Gefen and Carmel (2008) note in a study that uses data from a marketplace similar to ours: "Such contracts span from three to six orders of magnitude larger than the typical Rent A Coder contract and thus different marketplace behaviour is likely" (Gefen & Carmel, 2008: 11). The results of Chapters 2-4 should be generalized to larger transactions with much caution, as larger companies are likely to employ much more formalized procedures and rules for the choice of allocation mechanisms, choice of vendors and project execution.

Examples of more formalized procedures include studies into the procurement auctions of electronic components or automotive parts, where a winner is always selected (Jap, 2003; Zhong & Wu, 2006); and studies into the public procurement of construction services, where buyers are obliged to use tenders (rather than negotiations) when certain criteria (e.g. monetary volume of the project) are met (Bajari et al., 2006).

Other online marketplaces for IT services. Chapters 2 to 4 use transaction data from a single (although the most populated one) subdivision of a leading online service marketplace – Web Development. Other marketplaces for professional services, such as oDesk, onForce or eWork all have their own peculiarities in the way they allow entrance of buyers and vendors to the marketplace, the bidding procedures and the way collaboration between buyers and vendors is organized during the project

execution stage. Although our investigations (that are outside the scope of this dissertation) showed that at least part of the findings (e.g. those in Chapter 3) hold for the data from RentACoder marketplace as well, further attempts to apply our findings to other online marketplaces should at least take into account the difference in the design between the marketplaces.

Other services. As the area of the application of online reverse auctions is expanding within and beyond IT services and building construction services, other types of service contracts that start to be auctioned include professional services such as tax consulting, legal advice or language translation. The findings of this thesis are likely to be highly relevant for those services where evaluation costs represent an important issue (e.g. legal advice or tax advice), where auctioning and negotiating contracts are equally viable options, repeat buying is a commonplace practice and where the interaction between buyers and vendors during the project execution stage is complex and important for the overall project performance.

On the other hand, it is quite likely that other contexts contain numerous examples of different context-specific actor behaviour, and further research into these contexts will produce many valuable contributions for both theory and practice.

6.5. Further Research

We organize the discussion of suggestions for further research around the three familiar problem areas: auction context, service characteristics and buyer-supplier relationships. At the end of this section we also elaborate on several more general research themes inspired by this research.

6.5.1. Auction context, service characteristics and buyer-supplier relationships

There are several ways to generate additional insights into the three problem areas on the basis of what has already been done in this dissertation. We analyse them by discussing extensions to each of our four empirical chapters. For instance, the research in Chapter 2, *"Choosing between Auctions and Negotiations in Online Markets for IT Services",* can be further enhanced by providing a basis for assessing the relative effects of factors from our study as well as previous studies (especially the effect of project complexity) on mechanism choice. This can be achieved by collecting additional data from IT services buyers by means of a survey. This approach to data collection will also allow for the gathering of companies' demographic data and explicitly accounting for it in the analysis.

There are several ways to extend and capitalize on the findings of Chapter 3 *"Coping with Costly Bid Evaluation in Online Markets for IT Services"*. This can be done by separately or jointly applying a number of approaches and methods, such as analytical modelling, laboratory experiments and field research. First, further testing of the hy-

pothesized 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 researchers to extend the generalizability by ensuring control over interfering factors. Second, analytical modelling using auction theory can be applied to model buyer equilibrium behaviour with regard to the use of evaluation cost-reducing tactics.

An important direction for further research regarding Chapter 4 *"Heterogeneity of Buyer-Supplier Exchange Relationships in Online Markets for IT Services",* which can help gain insights into the sources of the heterogeneity, is the evolution of portfolios of exchange relationships over time. Another interesting direction for further research is testing the generalizability of the above findings across other online marketplaces and industries (e.g. building construction and professional services), as well as across firms of larger size.

In Chapter 4 we focused only on online transactions; however, they might provide an incomplete picture of buyers' exchange activities. Future studies should extend the scope by gathering and analyzing data on offline exchange relationships, along with online relationships.

With regard to Chapter 5 *"The Impact of Reverse Auctions on the Execution of a Construction Services Project",* future studies should be able to more fully explain the variation in the parties' relationships and project performance by simultaneously taking into account competences of boundary spanners on the contractors' as well as on the client's side, e.g. architects who manage the project on behalf of the client.

Further research into the impact of reverse auctions during the project execution stage and the effect of boundary spanners' relational exchange competences, in addition to the theory-testing directions already outlined in the discussion section, should focus on establishing the generalization of the present findings in other industrial contexts where reverse auctions are gaining ground, particularly in the IT services industry.

6.5.2. Other research directions

We identify several potential directions for future empirical research efforts that are inspired by contemplation of research approaches and techniques not utilized in our own research, but have the potential to generate very interesting insights.

For instance, except for touching upon the concept of the ego network in Chapter 4, we have not used any of the rich arsenal of social network theory or its analytical techniques. Some of the vast opportunities here would include studying the network structure of online service marketplaces (Radkevitch et al., 2007; Van Heck & Vervest, 1998). Representing buyers and vendors as two types of nodes of a single network, with links being bids for projects and/or executed projects, could tell us much about the geographical aspects of IT projects and working patterns between

the two sides. Particularly interesting could be an examination of the evolution of such networks, which would allow a great deal of insight into how vendors learn to bid, compete, and deal with buyers; under what circumstances actors choose to leave the marketplace; what is the link between competitiveness and the network structure, etc. It should be possible to acquire the data necessary for such research by establishing cooperation with online service marketplaces.

Another potentially fruitful research avenue could be comparative studies of different marketplaces, by means of analysing transaction data or conducting quasi-experiments. This is a way to gain insights into how differences in marketplace design (e.g. entry rules, information architecture, reputation system, etc) affect outcomes such as bidding for projects, auction prices, project allocation and performance in projects. As far as our knowledge is concerned, this research avenue has so far been barely touched upon (Radkevitch, van Heck, & Koppius, 2006b).

One last opportunity to be discussed here consists in combining online transaction data with data on the offline activity of actors and their demographic characteristics, which can be done, for instance, by means of surveys. This would allow us to understand how online and offline transactions differ from and complement each other, something that has been previously studied mostly by theoretical studies (Kim & Altinkemer, 2006; Kleindorfer & Wu, 2003), but has recently started to be realized in empirical work as well (Brynjolfsson, Hu, & Simester, 2007).

We hope that pursuing the outlined research directions will help to further advance academic and practical knowledge on the procurement of services by the means of online reverse auctions, to which this dissertation has made several contributions.

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Samenvatting (Summary in Dutch)

Online omgekeerde veilingen voor het inkopen van services

Online omgekeerde veilingen, waarbij de kopers de verkopers selecteren en de winnende verkoper het contract krijgt, hebben zakelijke inkoopactiviteiten sterk verander in het begin van de 21ste eeuw. Kort nadat General Electric de eerste omgekeerde veilingen introduceerde, waren bedrijven snel in het adopteren van deze type veilingen om de inkoopprocessen van producten en diensten te optimaliseren. Echter, de adoptie van omgekeerde veilingen werd tegengewerkt door leveranciers, industriële verenigingen en zelfs een aantal kopers door het ontstaan van negatieve effecten van veilinggerelateerde concurrentie. De hype is inmiddels verdwenen en bedrijven gaan door met hen experimenteren met online omgekeerde veilingen. Daarom is het belangrijk om begrip te krijgen voor effecten van de interacties tussen de veilingcontext, dienstkarakteristieken en koper-verkoper relaties op veilingresultaten en het succes van veilinggerelateerde projecten.

Dit proefschrift onderzoekt het gebruik, proces en uitkomsten van online omgekeerde veilingen in dienstensector. Doordat diensten (zoals softwareontwikkeling, bouw van gebouwen) over het algemeen complexer zijn dan producten, zijn diensten tevens moeilijker te omschrijven, informatie betreffende transactieaspecten is vaak asymmetrisch en intensievere communicatie tussen bedrijven is vereist. Dit vormt een uitdaging voor bestaande theorieën, die veilinguitkomsten analyseren. Om systematisch praktisch inzichten te verkrijgen en een theoretische begrip te ontwikkelen omtrent omgekeerde veilingen voor diensten, werden in deze studie verschillende aspecten van veilinggerelateerde contracten geanalyseerd, waaronder de keuzes van kopers tussen veilingen en onderhandelingen, de beslissingen rondom contracttoekenning binnen veilingen, de heterogeniteit van inkoopgedrag van kopers en de gerelateerde prestaties, en het effect van veilinguitkomsten op koper-verkoper relaties en projectprestaties gedurende de uitvoeringsfase van projecten.

Vier empirische onderzoeken zijn uitgevoerd om onderzoeksvragen te beantwoorden. Drie van deze empirische onderzoeken zijn uitgevoerd in de context van online markten voor IT diensten, waar duizenden kopers en verkopers elkaar ontmoeten en transacties uitvoeren. We hebben data over 10,000 afzonderlijke transacties verzameld. We hebben tevens data over ongeveer 100 actieve kopers. Deze gegevens beslaan hun individuele koopactiviteiten over enkele jaren. Verschillende statistische technieken, waaronder zowel confirmerende als verkennende benaderingen, zijn gebruikt om de data te analyseren. Het vierde onderzoek is een 9-maanden durende longitudinaal verkennende case study over de veiling en realisatie van een gemeentelijke gebouwrenovatie project in Amsterdam.

De onderzoeksresultaten leiden tot de volgende inzichten: 1) door de herhaaldelijke interacties met verkopers én de tevredenheid over de eerdere verkoperprestaties hebben kopers meer voorkeur voor onderhandelingen (in plaats van gebruik van veilingen) om het volgende project, 2) de identificatie van vijf koperstactieken, die de waarschijnlijkheid van contracttoekenning vergroten 3) de identificatie van vier patronen voor het aankopen diensten (transactie kopers, herhaaldelijke kopers, kleine diversifieerders, en grote diversifieerders) en tevens de theoretische eigenschappen geïdentificeerd, en (4) uitleggen hoe de uitkomsten van omgekeerde veilingen in de bouwsector kunnen bijdragen aan verregaande beperkingen van de rollen van projectmanagers en hoe project managers relationele marktcompetenties kunnen gebruiken om deze beperkingen te overwinnen.

Het aankopen van diensten via omgekeerde veilingen verschilt van het aankopen van producten. Dit proefschrift maakt de eerste step in de ontwikkeling van theorieën om dat verschil te verklaren.

Аннотация (Summary in Russian)

Онлайновые обратные аукционы для закупки услуг

Распространение онлайновых обратных аукционов, на которых покупатели выбирают поставщика, а поставщики конкурируют за контракты, произвело революцию в сфере корпоративных закупок в начале 21-го века. Вскоре после того, как такие аукционы был впервые внедрены корпорацией Дженерал Электрик, множество компаний поспешили принять их на вооружение для оптимизации деятельности по закупке товаров и услуг. Однако, в скором времени распространение обратных аукционов натолкнулось на сопротивление со стороны ряда поставщиков, промышленных ассоциаций и даже некоторых покупателей, поскольку стали проявляться отрицательные последствия жесткой конкуренции, которую такие аукционы поощряют среди поставщиков. Сегодня ажиотаж вокруг обратных аукционов несколько спал, но множество компаний продолжают активно экспериментировать с их использованием для организации закупок. В связи с этим представляется важным выяснить, каким образом взаимодействие контекста, в котором проводятся аукционы, характеристик покупаемых услуг, и взаимоотношений между покупателями и поставщиками, влияет на результаты аукционов, а также на успешную реализацию размещенных посредством аукционов контрактов.

Данная диссертация на соискание степени PhD исследует использование, процессы и результаты онлайновых аукционов по закупке услуг. Поскольку услуги (такие как разработка программного обеспечения, строительные услуги) зачастую более сложны для четкого описания, чем товары, а информация касательно различных аспектов транзакций асимметрична, возникает необходимость более интенсивного взаимодействия между покупателем и поставщиками для осуществления таких транзакций. Эти обстоятельства бросают вызов существующим теориям, объясняющим результаты аукционов. Для того, чтобы получить систематическое представление о реальной практике проведения обратных аукционов по закупке услуг и расширить их понимание с теоретической точки зрения, мы изучили ряд важных аспектов проведения таких аукционов. В частности, мы изучили проблему выбора покупателя между использованием аукциона и двусторонних переговоров для размещения контрактов на онлайновых рынках ИТ-услуг; проблему принятия решения о размещении или не размещении контракта покупателем по результатам аукциона; гетерогенность поведения покупателей ИТ-услуг и ее последствия для успешной реализации контрактов; а также влияние результатов аукционов на взаимоотношения между покупателем и поставщиком и успешность контракта на стадии его реализации в контексте строительной отрасли.

Для того, чтобы ответить на поставленные вопросы было осуществлено четыре исследовательских проекта. Три из них были реализованы в контексте онлайнового рынка IT-услуг, где десятки тысяч покупателей и поставщиков IT-услуг находят партнеров и реализуют проекты по созданию веб-сайтов и программного обеспечения. Мы собрали и проанализировали данные о более чем 10.000 подобных транзакций, а также подробные данные об истории закупок, осуществеленных сотней активных покупателей за период протяженностью в несколько лет. Для анализа данных был использован широкий набор статистических методов, направленных как на верификацию, так и на генерацию гипотез. Четвертый проект – это анализ конкретного случая (longitudinal case study) проведения онлайнового тендера и реализации строительного проекта по реновации муниципального здания в Амстердаме.

В результате исследования получены следующие основные результаты. Во первых, установлено, что повторные транзации между поставщиками и покупателями, а также уровень удовлетворения от оказанных поставщиком услуг в предыдущих транзакциях положительно влияют на использования переговоров (а не аукционов) покупателем для размещения следующего проекта. Во-вторых, выявлено пять тактик, которые позволяют покупателям повысить вероятность размещения контракта за счет снижения издержек на оценку предложений поставщиков в контексте онлайнового рынка IT-услуг. В третьих, выявлено четыре вида устойчивого поведения покупателей (мы назвали их Транзакционные покупатели, Реляционные покупатели, Малые диверсификаторы и Большие диверсификаторы) и их теоретические свойства; В-четвертых, выявлен механизм, посредством которого результаты обратных аукционов в строительной отрасли могут усилить ролевые ограничения прокт-менеджеров, а также, как менеджеры могут пользоваться своими социальными компетенциями для преодоления таких ограничений.

В целом, закупка услуг посредством онлайновых обратных аукционов значительно отличается от закупки товаров. Данная диссертация делает первый шаг к тому, чтобы отразить существующие различия в усовершенствованных научных теориях.

Curriculum Vitae

Ulad Radkevitch was born on April 22, 1978 in Minsk, Belarus (part of the Soviet Union at that time). He graduated cum laude with an MA in International Economic Relations from the Belarusian State Economic University (Minsk) in 2000. Before joining the Department of Decision and Information Sciences at RSM Erasmus University as a PhD student in 2003, he held several positions in marketing and business development in the IT outsourcing industry.

During Ulad's PhD trajectory, his research was presented at a number of academic forums including *International Conference for Information Systems, INFORMS Annual Meetings, ICIS PhD Consortium, Smart Sourcing conference, Research Symposium for Emerging Electronic Markets* and others. Ulad's publications have been accepted to *Decision Support Systems* and *Journal of Information Technology Cases and Application.* During his PhD years, Ulad served as an ad-hoc reviewer for *ICIS, ECIS, Journal of Information Technology* and *Electronic Markets.* He has also coached Master students, taught a Bachelor course on *Global Sourcing* and wrote several professional articles for *Outsourcing Journal.*

Since April 2008 Ulad has been working as a VP Marketing, sales and business development at ScienceSoft, an IT service firm located in Minsk, Belarus.

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ONLINE REVERSE AUCTIONS FOR PROCUREMENT OF SERVICES

Online reverse auctions, in which a buyer seeks to select a supplier and suppliers compete for contracts by bidding online, revolutionized corporate procurement early this century. Shortly after they had been pioneered by General Electric, many companies rushed to adopt reverse auctions but the adoption soon slowed down due to the negative effects of auction-induced competition. Today, as firms continue to experiment with the reverse auctions, it is important to understand how the interplay of the auction context, the service characteristics, and buyer-supplier relationships affects auction outcomes and the success of the auctioned projects.

This PhD dissertation investigates online reverse auctions in service industries (e.g. software development, building construction). The differences between services and products (services can be more difficult to describe and require more intensive communication) challenge theories that try to explain auction outcomes. We study several aspects of auctioning service contracts: the buyer's choice between auctions and negotiations; the contract allocation decisions in auctions; the heterogeneity of buyers' procurement behaviour; and the effect of auction outcomes on buyer-supplier relationships and project performance during the project execution.

Some of the key findings are: 1) that the buyer's repeat exchange interaction with vendors as well as the satisfaction with a vendor's past performance lead to the buyer's preference for using bilateral negotiation to allocate the next project; 2) that there are five buyers' tactics that allow to increase the likelihood of contract allocation; 3) that the outcomes of online reverse auctions can aggravate project managers' role constraints and that project managers can use relational exchange competences to overcome these constraints.

Overall, buying services through online reverse auctions is quite different from buying products. This thesis makes the first steps to develop theoretical knowledge to account for that difference.

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