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PORTFOLIOS OF EXCHANGE RELATIONSHIPS:

AN EMPIRICAL INVESTIGATION OF AN ONLINE IT MARKETPLACE FOR SMALL FIRMS

Web-based Information Systems and Applications

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Abstract

Small firms face distinct problems and opportunities when procuring IT resources. Whereas previous work focused at the firm level or the buyer-supplier dyad, the present study addresses the portfolios of the buyer's exchange relationships with suppliers at an online marketplace for IT services. We draw on social network theory to measure portfolios as the buyer's ego network. Using clustering techniques, we empirically derive a taxonomy of portfolios of small firms' buying IT services and analyze cluster antecedents and outcomes.

Our investigation reveals four clusters of buyers' ego networks: transactional buyers, relational buyers, small diversifiers and large diversifiers. Each of these clusters has a distinct and different mix of long-term and short-term relationships with selected suppliers. Reverse auctions are found to be associated with a short-term exchange relationship orientation, while bilateral negotiations support long-term orientation. Buyers in different clusters use the two exchange mechanisms in combination to a different extent.

Keywords: Online markets, IT services, buyer-supplier relationships, reverse auctions.

Introduction

Traditionally, small firms face more difficulties accessing and using information technology (IT) resources, including access to IT outsourcing providers, than their larger counterparts (Carmel & Nicholson, 2005; Nooteboom, 1993). However, with the growth of IT spending by small firms, wide-spread use of the Internet and emergence of a wide range of intermediaries, the situation has started to change. The recent rise of online marketplaces for professional services contributes to improving the access of small firms to offshore suppliers of outsourcing services. IT services, such as Web site design and software development, are a primarily focus for these marketplaces. The leading online marketplaces include Elance Online, Rent a Coder and eWork.

Marketplaces for IT services provide a valuable ground for studying a number of exchange-related issues of high theoretical and practical importance. Recent studies addressed bidding and buying behavior under costly bidding and bid evaluation (Carr, 2003; Snir & Hitt, 2003); market participation costs (Snir & Hitt, 2004) and buyer's commitment and opportunism (Radkevitch, van Heck, & Koppius, 2006). The present study focuses at two main themes that emerge in light of the increasing use of online IT marketplaces by small firms: the development of long-term as opposed to short term buyer-supplier relationships and the underlying use and impact of exchange mechanisms (open reverse auctions versus negotiations).

This study takes an exploratory approach. We aim at deriving a taxonomy of repeat buyers (small firms) of IT services based on buyers' relationship orientation and exchange mechanism use. Ego networks, or portfolios of exchange relationships, have been chosen as a unit of analysis to enable the focus on the combination of these dimensions. The main research question this study intends to answer is this: What types of buyer ego networks are formed at online IT marketplaces for small firms?

From a theoretical perspective, the study contributes to the understanding of the different configurations of buyer-supplier relationships in online IT markets. From a managerial perspective, we provide insights into how online markets for IT services, while traditionally aimed at enabling short-term efficiencies, could also serve exchange relationships that rely on long-term considerations.

The remainder of the paper is organized as follows. First, we discuss theoretical roots of the taxonomy dimensions. This is followed by a discussion of the methodology, the data, and the analytical procedures. Finally, we discuss the empirical findings and formulate conclusions and theoretical and managerial contributions.

Theoretical Background: Portfolios of Exchange Relationships

As the objective of this paper is to explore empirical configurations of buyer-supplier relationships and buyers' use of exchange mechanisms, we chose to focus on the buyer ego network as a unit of analysis. An ego network consists of an ego (central node or firm in our case), alters (the nodes or firms the central firm is connected to), ties between ego and alters (in our case, projects between the buyer and suppliers) and ties between alters (the latter is not applicable in our case as the different bidders do not have a relationship). The concept of ego network in social network analysis resonates with the concept of "portfolio of relationships" in the marketing literature. For instance, Bensaou, (1999) used this concept in his study of the relationships between manufacturing companies in the automotive industry and their suppliers. Similarly, by using ego networks or portfolio of relationships in the present study, we are able to capture the key dimensions of interest in the taxonomy development as structural or compositional properties of ego networks. In the remainder of the paper we are using both terms (buyer ego networks and portfolios of relationships) interchangeably.

The literature tradition in both inter-organizational relationships and information systems contains confirmatory and exploratory approaches to empirical research. Confirmatory approaches take a taxonomy deduced from 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 them 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 area of inter-organizational relationships the exploratory approach has been employed to extract and analyze empirical patterns of inter-organizational 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 buyers and relate resulting buyer types to auction winning likelihood and extracted surplus (Bapna et al., 2004).

Taxonomy Dimensions

Inter-organizational Relationships

The two polar modes of interorganizational exchange relationships are transactional and relational exchange. Transactional exchange is characterized by short-term, arm's-length transactions with a competitive attitude (Dyer & Singh, 1998). Four characteristics of transactional exchange are: 1) nonspecific asset investments, 2) minimal

information exchange, 3) separate technological and functional systems within each party; low interdependence between the systems; 4) low transaction costs and minimal investments in governance (Dyer et al.., 1998). While in transactional exchange firms exploit market efficiencies to derive one-time profit, in the relational exchange firms are seeking "relational rent" over a longer period of time and/ or over a series of transactions (Ganesan, 1994). In the relational exchange, parties rely on relational attributes, such as trust, commitment, collaboration, information sharing, etc. (Dyer et al.., 1998; Ganesan, 1994).

While in the literature on interorganizational relationships a lot of efforts have been invested into the research on the stages and processes of relationships development (Narayandas & Kasturi, 2004; Ring & Van de Ven, 1994) and the interplay between transactional and relational elements of exchange (Poppo & Zenger, 2002; Radkevitch & van der Valk, 2005), relatively little has been said on the role and development of relationships in situations that are characterized of both transactional and relational exchange. These can be, for example software development projects, where parties work jointly on system requirements, develop functional specifications, solve problems during the project run and deploy the application. While we do not set out to explore how relationships develop over time, we do try to uncover the empirical types of relationships from the viewpoint of short versus long-term orientation.

Reverse Auctions

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, Kaufmann, Beall, & Carter, 2004; Jap, 2003) and make them concerned about buyer's opportunistic behavior (Jap, 2003). On the other hand, reverse auctions are compatible with several dimensions of relational exchange, as reverse auctions can be used to source long-term contracts, can co-exist with a high level of trust (Radkevitch et al.., 2005) and collaborative buyer-supplier relationships (Smart & Harrison, 2003). In addition, in real-life situations, bidder and buyer behavior is influenced by a variety of factors that are not covered in existing auction theory (Jap, 2002). Therefore, the extent of the use of reverse auctions by repeat buyers is the second dimension of our taxonomy.

Transaction Characteristics

Transaction cost economics regards transaction characteristics as a determinant of exchange governance (Williamson, 1985). High level of transaction attributes such as frequency of transactions, asset specificity and technological uncertainty calls for hierarchical exchange governance to minimize the transaction costs. While hierarchies are efficient in keeping down 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 when choosing 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 fit well competitive bidding (Bajari & Tadelis, 2001). Therefore, our third dimension is related to the complexity characteristics of IT projects.

Antecedents of Portfolio Composition

Several constructs can shed light on the emergence of the clusters of buyers and their performance outcomes and also contribute to the validity of our taxonomy.

Buyer Commitment/ Opportunism

This construct was introduced in Radkevitch et al.. (2006, where it was explored on the level of individual transaction and shown to influence the likelihood that a contract will be awarded. Here we extend its use to the level of portfolio of relationships (ego networks) in order to explore its impact on the way portfolios are organized.

Buyer Experience

Taking into account buyer's experience at the marketplace is important at least from the viewpoint that more experience means, ceteris paribus, that a buyer has worked on more projects and with larger overall budget. More experience allows more room for the development of long-term relationships with suppliers.

Performance Characteristics

Buyer Satisfaction

We intend to explain buyer satisfaction with the supplier performance as a performance characteristic related to different clusters. Throughout the literature, higher satisfaction is associated with a higher level of relational elements in the inter-organizational exchange (Griffith et al., 2006; Poppo et al.., 2002).

The conceptual framework is presented in Figure 1.

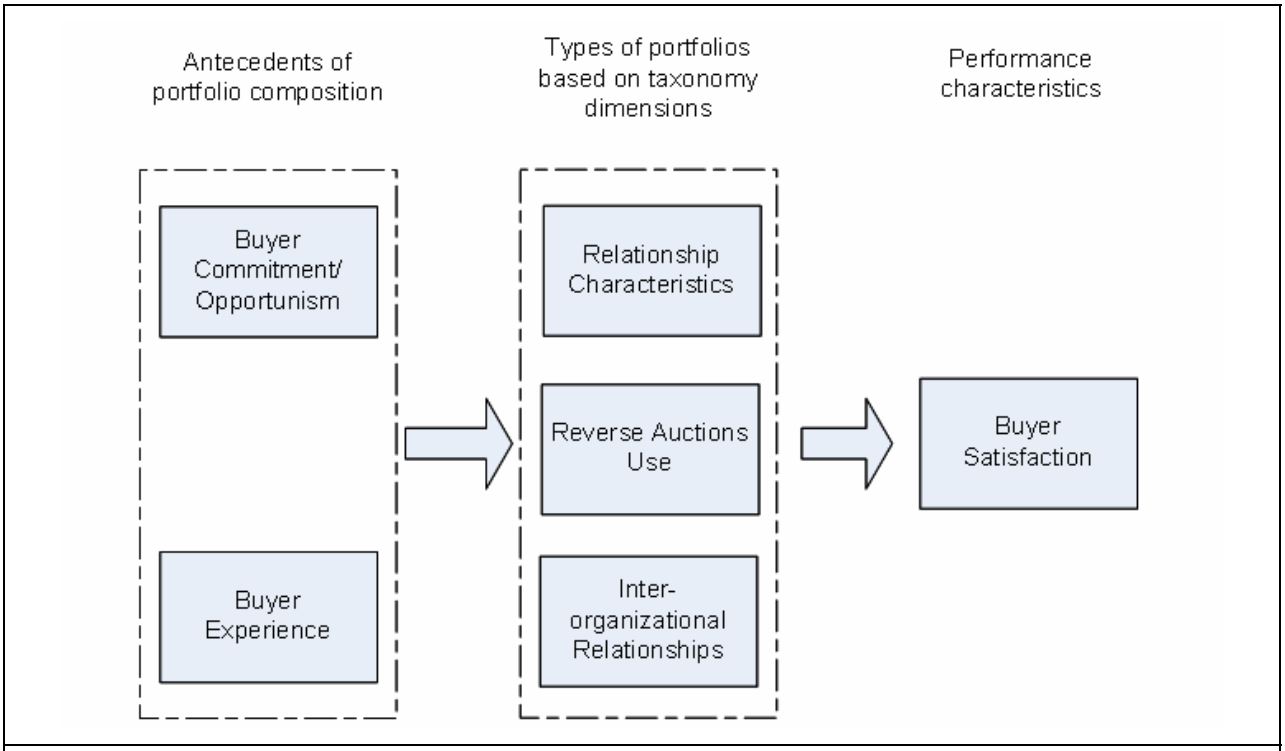

Figure 1. Buyer Portfolio Clusters Determinants, Antecedents and Outcomes

Methodology

Empirical Setting

The transaction data were obtained from a leading online marketplace for professional services, used by around 60.000 buyers. The range of services encompasses IT services and other professional services (e.g. translation, accounting, etc.). Software application development is one of the most populated areas of the marketplace. 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.

The exchange process is as follows. Before buyers and suppliers are able to enter the exchange they are required to register at the marketplace. Participation for buyers is free of charge while a periodical fee applies to suppliers (the

latter also pay a commission on accomplished transactions). The buyer starts an auction by posting a request for proposals (RFP). The 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 the open auctions the different suppliers are bidding and the buyer chooses the winner (which might not necessarily be the lowest bidder).

The buyer is able to rate supplier's performance. The accumulated supplier's rating is a part of the reputation and trust mechanism at the marketplace.

Data

We collected data on projects procured by buyers who were the most active in the Web Development, the most populated sub-marketplace. These included not only IT-related projects but also project from other areas of the online marketplace, as buyers typically do not confine their activities to a single sub-marketplace.

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 done enough projects to make up a reasonable portfolio. We identified most active buyers using a cut-off level of 20 awarded projects (this included all projects awarded at the marketplace, not only IT-related). This resulted in a sample of 530 buyers that awarded 20 to 300 projects each from 1999 until May 2006.

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

The procedure resulted in 105 ego networks containing data on 2,193 projects worth a total of USD 1,135,041.

Kapow RoboSuite software was used for web data extraction; MS Excel and SPSS were employed at the stage of data processing and analysis.

Operationalization

Table 1 summarizes the variables that operationalize our three taxonomy dimensions: relationship characteristics, reverse auction use and transaction characteristics as well as the antecedents and performance characteristics. Table 3 provides details on the 4-cluster solution.

Table 1. Cluster Dimensions, Antecedents, Outcomes and their Measures

Taxonomy dimensions	
Relationship characteristics	• Share of projects per supplier with the highest number of transactions (%); • Duration of relationships with the most often used supplier (days).
Reverse auction use	• Share of projects procured via open reverse auctions (%).
Transaction characteristics	• Portfolio size (USD); • Average project price (USD); • Average project length (days).
Cluster antecedents	
Buyer commitment/ opportunism	• Number of awarded projects divided by number of posted projects
Buyer experience	• Total spend (USD) • Overall number of awarded projects

	• Duration of the presence at the marketplace (days)
Performance characteristics	
Buyer satisfaction	• Average satisfaction rating

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 by Bapna et al.. (2004).

First, we applied K-means clustering method to find a number of different cluster solutions for our dataset. The method clusters objects into k partitions based on their attributes. The method assumes that the attributes form a vector space and aims to minimize total within-cluster variance. It is commonly used in the IS and marketing studies as a part of the procedure to established typologies of actors, e.g. bidders (Bapna et al.., 2004) or buyers (Bensaou and Venkatraman, 1994; Cannon and Perreault, 1996).

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 center (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 establish the optimal solution by dividing intercluster difference of a cluster by intra-cluster difference of the same cluster, which is dissimilarity ratio (Bapna et al.., 2004), and comparing them. The optimal cluster should have the highest dissimilarity ratio. According to the results in Table 2, in our case the first solution is the one with five clusters containing 11, 45, 5, 35 and 9 ego networks respectively.

Table 2. Dissimilarity Ratio

Number of clusters in a solution	2	3	4	5	6	7	8	9	10
Dissimilarity ratio	1.352	1.501	**1.611**	**1.701**	1.124	1.261	1.189	1.172	1.210

However, after comparing the 5-cluster solution with the 4-cluster solution (43, 43, 10 and 9 ego networks) we found only one main difference between them. This is that the 9-member cluster of the 4-cluster solution has split into two clusters and, combined with four members of a 43-member cluster, made up the 5 and 9-member clusters of the 5-cluster solution (we do not provide details on the cluster composition here due to space constraints). The composition of the other clusters remained mostly unchanged. Taking into account the similarity of the 4 and 5 cluster solutions, the marginal difference in their dissimilarity ratio and the small size of three clusters in the 5-cluster solution, it was decided to base the further analysis on the 4-clusters solution.

Based on the characteristics of ego networks in the clusters we came up with the following names for the buyers in these clusters: Transactional buyers, Relational buyers, Small diversifiers and Large diversifiers. The labels were assigned on the basis of how buyers seem to manage their suppliers and use exchange mechanisms.

Cluster 1. *Transactional buyers.* Most projects in ego networks of this type are procured via open reverse auctions (71%). Transactional buyers allocate 31% of projects to a single preferred supplier, the lowest level among all clusters, and also have the shortest duration of relationships with this supplier, 242 days. Interestingly, while their average project price is the smallest among all clusters (USD 390), their projects take longer to accomplish (47 days) than more expensive projects of Relational buyers (USD 486 and 31 days respectively). One possible explanation is that it takes longer for Transactional buyers to set up a sound communication and coordination with new suppliers.

Table 3. 4-cluster Solution					
	Transactional buyers	Relational buyers	Small diversifiers	Large diversifiers	ANOVA Z scores (Sig)
Share of projects per supplier with most projects, %	31	76	62	56	.000
Duration of relationships with the supplier with most projects	226	581	867	806	.000
Share of reverse auctions, %	71	19	43	33	.000
Portfolio size (USD)	7,664	9,366	8,236	35,685	.000
Average project price (USD)	390	486	458	1577	.000
Average project length (days)	47	31	119	64	.000
N	43	43	10	9	

Cluster 2. *Relational buyers.* These buyers use open reverse auctions the least of all four types (19% of cases). Their project value is higher than that of Transactional buyers (USD 486), which might be due not only to the projects' sheer size and complexity but also to the fact that Transactional buyers receive lower prices because of competitive bidding at reverse auctions. Another distinguishing factor is the allocation of a higher share of projects (76%) to a single preferred supplier. The duration of relationships with the preferred supplier, although being two times higher than the one of Transactional buyers, still falls considerably behind those of the both Diversifiers clusters. As the buyers in this cluster mostly use bilateral negotiations and allocate over ¾ of projects to a single long-term supplier we term them "Relational buyers".

Clusters 3 and 4. *Small diversifiers and Large diversifiers*. The two remaining clusters exhibit more similarities than differences, therefore we analyze them together. Considering the moderate levels of reverse auction use and a rather high share of projects allocated to the preferred supplier, we suggest that buyers in both these clusters might be combining long-term suppliers with a fair share of short-term, transactional relationships. Hence the choice of the name– "diversifiers". Buyers in these clusters prefer to allocate projects via negotiations over auctions, the latter being used in 43% and 33% of cases respectively. Similarly, they favor single preferred suppliers (allocating to them 62% and 56% of projects), although to lower extent than Relational buyers. The duration of their relationships with the preferred suppliers is equally long – 867 and 806 days respectively. The differences between *Small Diversifiers and Large diversifiers* lie in the size of the portfolio, in which Large diversifiers are far ahead any other cluster (USD 35,685) and the project length. With regard to the latter, Small diversifiers have the lead with 119 days, which is almost two times higher than the project length of Large diversifiers, whose project value is over three times higher. A possible reason is that these are smaller firms or individuals lacking project management skills or have one or several extremely long projects that affect the average project length.

The next step in the analysis is to determine the links between clusters and their antecedents and performance. We conduct ANOVA to test for significance of the differences between the means of the variables that underlie the antecedents and outcomes, see Table 4. With regards to the antecedents, all differences between the means are significant. The difference in the level of satisfaction is not significant.

Buyer commitment/ opportunism. The analysis shows a linkage between the relatively low project award rate and two clusters: Transactional buyers and Small diversifiers. This can hardly be explained by the properties of the projects such as complexity and uncodifiability, as the projects come from rather homogenous categories. Also, it

cannot be explained by the differences in the project value, as it is only marginally higher for Transactional buyers and Small diversifiers than for Relational buyers and is much lower than in Large Diversifiers cluster. A plausible explanation, in line with Radkevitch et al.. (2006), is that Transactional buyers and Small diversifiers are more opportunistic and have a tendency to post projects without awarding them to suppliers. Instead, they might sometimes use the marketplace for price benchmarking or obtaining free advice from suppliers (Radkevitch et al.., 2006).

Table 4. Antecedents and Outcomes of Cluster Variables

	Transactional buyers Mean (st. dev)	Relational buyers Mean (st. dev)	Small diversifiers Mean (st. dev)	Large diversifiers Mean (st. dev)	ANOVA Sig.
Number of awarded auctions/ Number of posted projects*	0.77 (0.15)	0.86 (0.17)	0.78 (0.14)	0.87 (0.21)	.076
Number of awarded projects*	74.88 (47.85)	60.81 (42.42)	52.70 (22.86)	97.11 (62.37)	.083
Total spent USD***	27,891 (21,165)	32,887 (39,802)	19,902 (12,004)	87,670 (32,447)	.000
Duration of presence at the marketplace*	1,593 (551.36)	1,352 (430.63)	1,644.30 (394.48)	1,682 (317.14)	.051
Average satisfaction	4.84 (0.53)	4.88 (0.5)	4.82 (0.31)	4.89 (0.14)	.970
N (listwise)	43	43	10	9	

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

Buyer experience. There are no drastic differences between Transactional and Relational buyer in terms of their experience. Although Transactional buyers have been marginally longer present at the marketplace (1,593 versus 1,352 days) and have a higher overall number of awarded projects (this means not only IT-related projects but also project in other sub-marketplaces), the volume of their spent is lower (USD 27,891 versus USD 32,887). A likely conclusion is that the ego networks of transactional type reflect a deliberate stance of buyers toward organizing their exchange relationships, rather than a universal stage in the evolution of ego networks.

With regard to diversifiers, although Small diversifiers have been present at the marketplace for almost as long as Large diversifiers, they are much less active both in terms of the number of awarded project and overall transaction volume. This might be related to a smaller size of these firms (for which we, unfortunately, are unable to control).

Buyer satisfaction. The lack of significance in the level of satisfaction between different clusters is most probably due to that fact that buyers use performance ranking mostly to reward or punish suppliers, rather than to objectively rank the performance. Over 90% of ranked projects have the highest possible rating. Another possibility is that buyers succeed in choosing the right suppliers given their strategic objectives, thus constantly achieving the highest possible outcome.

Discussion and Conclusions

There are several key findings in the present study. First, our exploratory approach revealed the existence of four clusters of repeat buyers at the marketplace – transactional buyers, relational buyers and small diversifiers and large diversifiers. These labels were derived on the basis of buyers' exchange relationships orientation and their use of exchange mechanisms. While transactional buyers tend to switch suppliers often, relational buyers develop long-term dyads with selected suppliers. The existence of a relatively large cluster of buyers that rely on long-term relationships with the suppliers comes somewhat as a surprise, as the marketplace positioning and functionality

emphasizes a competitive, transactional way of procuring IT services. The clusters of Small and Large diversifiers seem to combine both arm's-length and close ties with their suppliers. The high levels of experience across all clusters indicates that these clusters are not simply intermediary stages of the evolution of buyer's ego networks, but rather deliberate stances that are defined by an inherent intention of different buyers to pursue different relationship strategies.

Second, reverse auctions are found to be associated with a short-term relationship orientation, while bilateral negotiations support relational orientation. However, even relational buyers use open reverse auctions to a certain extent. This is a sign that different exchange mechanisms may be used interchangeably at different stages of the development of supplier portfolios. For instance, a buyer can first select one or several sequential projects via the competitive open auction procedure. At a later stage, when the supplier's quality has been proven and longer-term relationships start to emerge, the buyer switches to a non-competitive bilateral negotiation procedure. Similarly, a relational buyer can occasionally hold an auction to check whether or not a better supplier has become available in the meantime and then possibly switch to the new supplier and build a relationship with that supplier. Therefore, while transactional buyers use reverse auctions for an optimal project allocation though competitive bidding, relational buyers use reverse auctions as a screening instrument, substituted with bilateral negotiation for further projects once the trust in a supplier has been established.

Third, this study has implications for practice. We showed that long-term cooperative relationships do develop between at competitive marketplaces for IT services. As the reliance on relational elements in a bilateral exchange is growing, the need for the mechanisms of formal governance (e.g. formal terms and conditions, arbitration, rating systems) decreases and the parties become less dependent on the marketplace for further transactions. As the costs of carrying out exchange via online marketplace exceed the benefits, the established buyer-supplier dyads may leave the marketplace and embark on off-market exchange. To prevent buyer-supplier dyads from leaving, online marketplaces need to cater for "relational" exchange. They must address key characteristics of such exchange, such as it long-term nature; intensive information exchange and re-use of accumulated knowledge. In other words, the online marketplaces for IT services need to provide a collaboration platform for relational exchanges.

One interesting direction for further research might testing the generalisability of the presented finding across other online marketplaces and service categories as well as across firms of larger sizes. Another potential direction is the study of the dynamics of ego networks evolution.

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