

The Impact of Online Reverse Auction Design on Buyer–Supplier Relationships

As the use of online reverse auctions in industrial-sourcing activities grows, buyers and suppliers are increasingly concerned about these auctions' effects on their interorganizational performance (i.e., suspicions of opportunism, overall satisfaction, and future expectations). This research examines how the buyer's auction design (i.e., the number of bidders, the economic stakes, and price visibility) and the price dynamics over the course of the auction affect its relationship with suppliers. Analysis of 25 quasi experiments involving 125 suppliers and \$385 million in procurement contracts suggests that the larger the number of bidders, the larger the economic stakes, and the less visible the price in an auction, the more positive is the impact on the interorganizational relationship. Large price drops (higher savings) over the course of the event have a detrimental effect on the buyer–supplier relationship. For auctions in which the lowest bidder wins, there is a decrease in opportunism suspicions as the economic stakes of the auction increase, and there is an increase in opportunism suspicions in auctions with greater price visibility. Implications for the management of industrial procurement activities are considered.

Designing the right kind of auction will have as big an impact on the brand, customer loyalty, and profit margins of the undertaking as will the designing of the right kind of products.

—Economist Hal Varian (Schrage 2000)

The use of online reverse auctions is becoming a permanent fixture in industrial sourcing, and they have been used to procure billions in parts and services in the government sector and virtually every major industry.¹ Although the current usage of these auctions as applied to a firm's overall spending is still in the single-digit range, the potential applicability of these auctions is as high as half of the firm's annual expenditures, with 10%–15% on average being most likely (Beall et al. 2003). Thus, there is substantial opportunity for growth, and these auctions already have had, and will continue to have, a profound impact on the process and manner in which firms source their goods and services.

¹The term "reverse" reflects the fact that sellers rather than buyers bid and that the goal of the auction is to drive price down rather than up.

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There has also been a corresponding growth in interest among academic researchers, who have considered these auctions from a variety of perspectives, such as computer science, economics, marketing, operations research, and sociology. In 2003, *Management Science* featured a two-part special issue on e-business, in which online auctions and e-procurement represented the largest proportion (32%) of all the articles featured. Despite this growing attention, there is little work that considers the interface between online reverse auctions and the interorganizational context in which these auctions are deployed, even though the burgeoning literature on interorganizational relationships indicates that the buyer–supplier relationship plays a critical role in determining performance outcomes for both parties and can serve as a key source of strategic advantage.

The online reverse auction experience can affect the buyer's interorganizational relationship with the supplier in two ways: through the supplier's experience over the course of the auction and through the auction outcome itself (i.e., whether the supplier won the contract bid). However, the latter is less interesting than the former because it is expected that winning the auction would be better for the buyer–supplier relationship than losing. Moreover, the buyer cannot determine the auction outcome *ex ante*. However, the supplier's experience in the auction is, in large part, a function of the buyer's *ex ante* choices regarding the auction design, such as the number and type of participants, the contract size, and the format (i.e., the degree of price visibility and award rule). Because online reverse auctions are initiated and directed by buyers toward their suppliers, I consider how the buyer's choices of design elements affect the supplier's view of its relationship with that buyer; specifically, I consider the supplier's evaluations (i.e., satisfaction and opportunism suspicions) and future expectations (i.e., continuity intentions).

In their research on the benefits and risks of online reverse auctions, Smeltzer and Carr (2003) find that the loss of trust and impact on the buyer–supplier relationship is an overwhelming cause for concern for both buyers and suppliers. Only 5% of the people they interviewed suggested that online reverse auctions could potentially improve relationships. This implies that as much as 95% of the participants in online reverse auctions might not view them as helpful to relationships. Consistent with this conjecture, Carter and colleagues (2004) find that the vast majority of suppliers they interviewed reported that their relationship with the buyer was adversely affected. Jap (2003) provides quantitative evidence that the use of open bid (full price visibility) online reverse auctions adversely affects buyer–supplier relationships by raising supplier suspicions of buyer opportunism.

In light of this, it is imperative that buyers understand how to design online auctions in such a way as to minimize potentially adverse effects on their supply relationships and evaluate the impact of their decisions from the suppliers’ perspective. This research is an initial step in this direction. I draw on relevant theory in the interorganizational relationship management literature and emerging work on online reverse auctions as well as extensive field interviews with industrial buyers, suppliers, and online auctioneers to develop a set of refutable predictions about how the design and structure of online reverse auctions might shape the interorganizational buyer–seller relationship.

The connection between auction design and interorganizational relationship outcomes is empirically examined through the use of a quasi-experimental design, in which proprietary, primary data on relationships with buying organizations are collected from 125 suppliers before and after 25 online reverse auctions in various product categories and firms. The data are unique and enormously difficult to obtain, but despite their limitations, they provide intriguing insights into and unique learning opportunities for the relational impact of the design and structure of online reverse auctions on interorganizational outcomes. I also collect data on the design characteristics of each auction and model the

extent to which they exert a systematic impact on the supplier’s behaviors, evaluations, and expectations of its relationship with the buyer. I do not explicitly test the explanatory mechanisms but rather consider the degree to which the data are consistent with (“as-if”) my reasoning.

In what follows, predictions are developed that relate the design elements of online reverse auctions to supplier behavior, evaluations, and expectations. The quasi-experimental methodology is described along with an empirical examination of the data. The article concludes with a discussion of the results, directions for further research, and implications for management.

Conceptual Framework

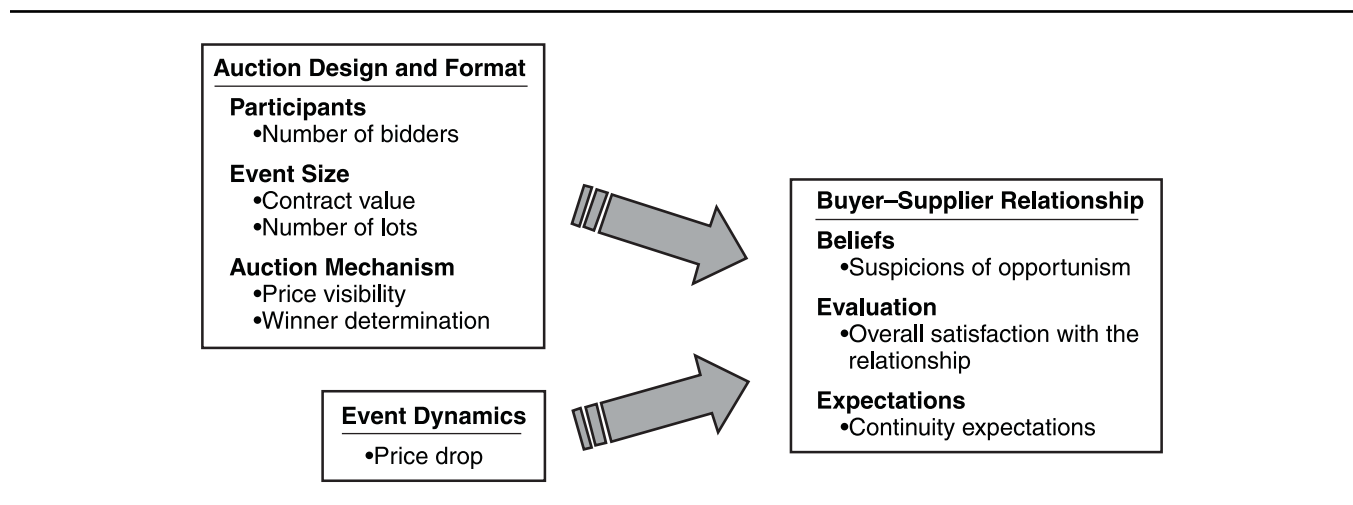
Throughout the discussion and methodology, the unit of analysis is the perspective of an individual supplier (not an online event) that is participating in an online reverse auction with one specific buyer. The auction design characteristics vary systematically across the auctions.

An overview of the conceptual model is provided in Figure 1. The general intuition is that the supplier’s relationship with the buyer is affected by two attributes of the online reverse auction event: (1) the design and format of the auction and (2) the price dynamics in the auction. The former is controllable by the buyer, and the latter is not. I begin with a brief review of the literature that is relevant to online reverse auctions and definitions of the supplier’s beliefs, evaluations, and expectations in the interorganizational relationship. Then, the specific auction design aspects and event dynamics are described, and predictions relating these to the interorganizational relationship are developed.

Online Reverse Auctions

Research that considers how auctions affect, or are affected by, the organizational contexts or the participants is emerging. Although sociologists have not developed a large literature on auctions, they have examined repeated auctions involving the same people, finding that people involved in repeated auctions tend to behave in ways consistent with

FIGURE 1
Conceptual Framework



social behavior theories rather than economic theories. Smith (1990) develops this view in more detail.

With regard to online reverse auctions, there are numerous studies that describe the online reverse auction process from preliminary steps to contract awards (see, e.g., Emiliani 2000; Mabert and Skeels 2002; Stein, Hawking, and Wyld 2003). Jap (2002) provides a conceptual overview of the differences between online reverse auctions in the marketplace and both physical auctions and those of the theoretical literature, as well as the conditions, structure, and evaluation of online reverse auctions. Kaufmann and Carter (2004) consider the conditions under which products should be auctioned electronically or in face-to-face negotiations.

Several studies have considered who the winners and losers are of online reverse auctions. For example, Smeltzer and Carr (2003) conduct 41 depth interviews to identify the potential benefits and risks of online reverse auctions for buyers and suppliers. Mabert and Skeels (2002) and Stein, Hawking, and Wyld (2003) rely on an in-depth case study to accomplish this. Haruvy, Rao, and Unver (2005) examine the conditions under which the buyer or supplier benefits from online reverse auctions from an analytical perspective, finding that differentiated suppliers in price-based auctions are economically worse off than buyers and that this relationship reverses when auctions that incorporate nonprice features are used.

There are several studies related to the intersection of online reverse auction design and its impact on interorganizational relationships (see, e.g., Carter et al. 2004; Jap 2003; Millet et al. 2004). Subsequently, I review these studies and outline the important ways the current research coincides and differs from them.

Millet and colleagues (2004) examine how various levels of supplier participation (i.e., invitation, logging into an event, and bidding) and auction characteristics (i.e., auction format and price visibility) affect the total price savings that an online auction event generates. They use data from more than 14,000 auctions and find that different auction formats lead to different levels of supplier participation and savings.

Carter and colleagues (2004) examine similar issues, but they rely on depth interviews with buyers, suppliers, and auctioneer participants in online reverse auctions. They attempt to deduce the impact of auctions on productivity and cycle time and consider the design factors associated with auction success, which they define as the perceived price savings from the online auction compared with face-to-face negotiations. They find that more successful auction events also tend to have a higher number of bidders, larger purchasing contracts, and lots and use a partial price visibility format. Although both Carter and colleagues and Millet and colleagues consider auction characteristics similar to those considered in the current research, both authors specifically focus on the drivers of price reductions, not on the buyer-supplier relationship per se.

Both studies underscore the notion of auction design as an important strategic variable in determining auction revenues or savings. Although the independent variables that constitute auction design are not theoretically derived, they are a function of the specific online market context, and because both studies focus on the economic outcomes, they

can evaluate these variables across thousands of auctions. The current research examines design predictor variables similar to those in Millet and colleagues' (2004) study, but my perspective differs in important ways. The final bid prices generated in online auctions are important and can affect buyer-supplier relationships directly, but they fail to capture key aspects of interorganizational performance, such as quality, reliability, long-term supplier viability (Forker, Ruch, and Hershauer 1999; Narasimhan, Talluri, and Mendez 2001), and market conditions. Economic outcomes also fail to account for beliefs, evaluations, and expectations that are the critical building blocks of the buyer-supplier relationship. Thus, the dependent variables in this research (opportunism suspicions, overall satisfaction, and continuity expectations) are completely different and broader in scope than those used in prior research. Moreover, data on the specific nature of buyer-supplier relationships are significantly more difficult to obtain, requiring a customized, dynamic intervention around online reverse auction events, and as such, the sample size is considerably smaller than those in other studies on auction design.

To date, Jap's (2003) study is the only research that explicitly considers the impact of online reverse auctions on buyer-supplier relationships, finding that full price visibility auctions increase the supplier's suspicions that the buyer is acting opportunistically, whereas sealed-bid (no price visibility) auctions are less threatening and serve as an important wake-up call, increasing the supplier's willingness to make dedicated investments in the buyer. Although the current research and Jap's (2003) are both focused on the impact of the auction process (as opposed to the auction outcome) on the interorganizational relationship and use a similar research design, there are several key differences. For example, Jap (2003) considers only the two extremes of full price visibility and no price visibility, whereas the current research considers a popular intermediate option: partial price visibility. Moreover, Jap (2003) examines auctions that have just been introduced to the supply base, whereas the current research examines auction practices that have been ongoing and involve experienced buyers and bidders. Jap (2003) uses only 6 auctions, all conducted by a single organization in one industry, whereas the current research uses 25 auctions conducted by four different buying organizations in a variety of industries (automotive, chemicals, consumer products, and high tech). Finally, Jap (2003) takes a limited view of the buyer-supplier relationship, considering only suspicions of opportunism and willingness to make customized investments, whereas the current research investigates a wider range of independent variables (i.e., partial price visibility formats, number of bidders, event size, and winner determination) and dependent variables (i.e., beliefs, outcomes, and expectations of suppliers).² By considering a wider range of variables and contexts as well

²Thus, whereas Jap's (2003) work provides a useful starting point for understanding how online reverse auctions affect buyer-supplier relationships, it is relatively limited in terms of the number and types of specific design elements, product categories, outcome variables, and industries considered.

as many more design elements, the current research expands the understanding of the impact of online reverse auctions on buyer–supplier relationships and, more broadly, the interface between online technologies and critical inter-organizational processes.

The Interorganizational Relationship

In this subsection, I consider three facets of the interorganizational relationship that broadly influence the supplier's suspicions and evaluations of its relationship with the buyer: (1) the supplier's suspicions of buyer opportunism, (2) its overall satisfaction with the relationship, and (3) its expectations of continuity with the buyer. All three aspects are widely examined in the extensive literature on inter-organizational relationships and are often recognized as critical aspects of successful buyer–supplier relationships. Opportunism suspicions provide insight into the supplier's fundamental assumptions about the buyer's behavior and motives in the relationship. Overall satisfaction with the relationship is a key performance outcome, and expectations of continuity point to future exchange intentions.

Opportunism suspicions. A central tenet of exchange is that economic actors act opportunistically; that is, they seek their self-interests with guile. Opportunism has received increasing attention in recent years (see Brown, Dev, and Lee 2000; Jap and Anderson 2003; Wathne and Heide 2000) and is synonymous with misrepresentation, cheating, and deception, subsuming a range of (mis)behaviors, such as adverse selection, moral hazard, shirking, subgoal pursuit, agency costs, and free riding (Williamson 1996). Unlike distrust, which is a broad, metaconstruct with many facets and levels, opportunism is more delimited and behavioral in nature and should create reduced attributions of trust.³ I focus on the supplier's suspicions of opportunism rather than proven opportunism because the supplier typically cannot verify that the buyer is acting with guile.

Overall satisfaction with the relationship. The supplier's overall satisfaction with the relationship is a positive affective state that results from the appraisal of all aspects of a working relationship; it is a noneconomic measure in that it reflects the supplier's current overall attitude toward its relationship with a buyer (see Ruekert and Churchill 1984). This appraisal is conditioned on the supplier's expectations such that confirmation or exceeding these expectations leads to varying levels of satisfaction, whereas disconfirmation of the expectations reduces satisfaction or creates dissatisfaction. This conceptualization of satisfaction is one of the most studied outcome variables in interorganizational management research (for a review, see Gaski 1984; Geyskens, Steenkamp, and Kumar 1999; see also Ruekert and Churchill 1984).

Expectations of continuity. The supplier's expectations of relationship continuity reflect its perspective on the long-term viability of the relationship. When a firm expects that the relationship will continue into the future, it is more willing to engage in processes and make investments that will

enhance the relationship in the long run (Anderson and Weitz 1989; Heide and Miner 1992). Confidence in the future of the relationship is important, because without it, the supplier may adopt a short time horizon and refuse to engage in activities that do not pay off quickly and with certainty (Williamson 1993). The supplier might also be more likely to adopt a zero-sum game approach to exchange or a “tit-for-tat” attitude (Axelrod 1984) that could be dysfunctional to the well-being of the relationship in the long run.

Auction Design Aspects and Predictions

In this subsection, I consider specific aspects of auction design and develop the arguments for predictions. Every buying organization faces a set of choices regarding the composition of an online reverse auction. Broadly speaking, these choices involve the participants, the size of the event, and the auction mechanism. Industrial reverse auctions are typically only open to a set of selected bidders, who may vary in terms of their capabilities, capacities, cost curves, quality levels, and history with the buyer. The event size speaks to whether the economic stakes of the auction are significant enough to motivate the supplier to participate and provide competitive pricing, and the auction mechanism defines the bidding procedure—that is, the degree to which elements of the bid are disclosed to the bidders, how the closing price is set, and how the winner is determined. Another important element of the online reverse auction event that may shape the buyer–supplier relationship is the event dynamics, which characterize the degree of price movement over the course of the event. I now describe these four facets. It is important to note that each could be examined in myriad ways; for example, many characteristics of the participants are arguably important in terms of determining the nature of the subsequent buyer–supplier relationship. However, it is beyond the scope of this research to consider all the possibilities. Instead, I provide an initial consideration in the hope that it will stimulate further research on other attributes of auction design.

Participants. The buyer invites a select group of bidders and often completes prequalification examinations to ensure that bidders are capable of fulfilling the purchase contract. A primary decision is the number of bidders that should be invited to participate in the auction. In general, increasing the number of bidders raises price competition and the savings generated by the auction (see Bulow and Klemperer 1996). Consistent with this, Millet and colleagues (2004) find that bidder participation in an online reverse auction significantly improves with the number of bidders; the average number of bids from five-plus suppliers in an online reverse auction is more than double the number of bids in auctions with fewer than five suppliers. Given the potential for increasing price competition and decreasing margins as the number of bidders increases, suppliers are unlikely to view auctions with a large number of bidders positively. In this case, suppliers' suspicions of buyer opportunism may increase, and their overall satisfaction with the relationship and desire to continue working with the buyer in the future may decrease as they view the buyer as aggressively trying to cut supply base margins. Thus:

³Scholars across multiple disciplines do not fundamentally agree on the meaning of trust (Rousseau et al. 1998).

P₁: As the number of bidders in an online reverse auction event increases, there is a negative impact on the inter-organizational relationship.

Event size. The size of the event speaks to the value of the purchase contract. I consider two indicators of the economic stakes of the auction: (1) the value of the purchase contract and (2) the number of lots in the event. In general, the expectation is that higher economic stakes and increased opportunity motivate suppliers to participate in the auction.

The value of the purchase contract typically refers to the historic spending level for the specific contract or the expected value of a new purchase contract. The larger the contract value, the greater is the motivation to participate in the online reverse auction event (Grewal, Comer, and Mehta 2001). Millet and colleagues (2004) find that supplier acceptance rates of invitations to participate in an online reverse auction increases with the total value of the auction and decreases for auctions with fewer than three items. As the contract value increases, it becomes more worthwhile to provide intangible value by being responsive to and supportive of the buyer. Moreover, higher stakes might also signal the buyer's commitment to make the exchange successful (see Anderson and Weitz 1992). In turn, this should reduce suspicions that the buyer is acting opportunistically and enhance the supplier's satisfaction and desire to continue working with the buyer in the future.

P₂: As the contract value in an online reverse auction event increases, there is a positive impact on the interorganizational relationship.

Another motivating factor is the number of product lots in the event. A product lot is a grouping of items that are typically organized according to the suppliers' capabilities to bid on or produce each lot, similarities in manufacturing processes, delivery regions, and so forth. For example, if a buyer needs to procure 20 rubber parts, the buyer may group the parts into five lots, in which each lot is composed of parts that use similar manufacturing processes, subparts, or supplier capabilities. Buyers award contracts on the basis of lots and do not accept bids for partial lots or individual parts within a lot. Thus, suppliers must be capable of producing all parts within a lot. Because suppliers are able to choose whether to bid on any given lot, the lots also indicate the match between supplier capabilities and buyer needs; that is, suppliers will not bid on product configuration lots that they are not capable of supplying, because their bids are legally binding. By grouping the parts into lots, the supplier needs to produce only 5 (as opposed to 20) bids and can leverage economies of scale and manufacturing processes across products.⁴ As the number of lots in an event increases, it creates more varied opportunities in which the supplier can participate in bidding on the contract (Carter et al. 2004). Moreover, by combining lots into a consolidated spend, the total economic stakes are raised for the supplier, which may be the motivation necessary to gain the supplier's participation in the event.

⁴The alternative is for the buyer to require the supplier to participate in individual bidding events for each product, which would make the bidding process more cumbersome.

A potential counterargument is that the number of lots can be demotivating because too many lots may make the bidding process more complex. Because suppliers typically bid sequentially on the lots in an event, each subsequent bid on a lot may be conditioned on a previous bid because the supplier typically attempts to allocate a fixed capacity and resources across multiple selling opportunities. Thus, it is possible that in extreme cases, a large number of lots could be discouraging to the supplier's bidding efforts. On average, I anticipate that as the number of lots increases, the buyer provides more ways for a greater range of suppliers to participate and more varied opportunities to win a part of the total contract.

P₃: As the number of lots in an online reverse auction event increases, there is a positive impact on the interorganizational relationship.

Auction mechanism. The auction mechanism describes the bidding process—that is, the aspects of the bids that are visible to suppliers, the termination of the bidding process, and the determination of an event winner. The typical closing rule in industrial online reverse auctions is that when a scheduled end time is reached, the event continues until a period of time passes in which no bidding occurs. As an example, if an auction is scheduled to end at 3 P.M., but bidding is still occurring at 2:58 P.M., the actual close time will be pushed back another five minutes until two minutes pass in which no bidding occurs. All the auction events included in this research use this type of closing rule. Thus, I now consider variations in (1) price visibility and (2) winner determination formats.

The visibility of bids refers to the degree to which bidders are able to view competitive bids.⁵ In a full price visibility, or open-bid event, the bidders can see the bid of every supplier at every point in the auction event. However, this type of auction has several drawbacks because bidders may use the format to signal to others (which could encourage collusion), and bidding frenzies might encourage a winner's curse if suppliers overestimate the value of the contract. In addition, bidders do not need to bid as low as their private valuations if they observe that the level of bidding is much higher; their bids only need to be competitive.

Because of these shortcomings, many buyers have begun to use a partial visibility format, in which suppliers are not told the actual pricing levels but are given feedback only about their relative rank (whether they are the first-, second-, or third-lowest bidder) or are simply told the lowest bid price (and not the spread around this price) in real time. When suppliers do not know the exact level of the competitive bidding, they may be more compelled to bid to their bottom-line price to raise their probabilities of winning. In addition, when the buyer's goal is to identify the top three bidders to negotiate further with postauction, a partial visibility approach may be sufficient; there is no need to allow the low bidder to know how much lower its bid is than the second-lowest bidder (Carter et al. 2004).

⁵Visibility does not refer to the identity of the supplier. In virtually all online reverse auctions, bidders do not know the true identities of their competitors.

These partial visibility auctions are growing in popularity, and I contrast this format to full visibility auctions.

Full price visibility tends to be more detrimental to buyer-supplier relationships than no price visibility (Jap 2003). This is because price competition is explicit in the full visibility format, and the compressed time frame for bidding and the fast-paced nature of the event create a stressful context for suppliers. By making every bid visible to all bidders, suppliers reveal information about their private expectations of the value of the purchase contract. Together, these factors increase supplier bargaining costs and make the process so disagreeable that suppliers will accept renegotiation rather than persist with current pricing levels (Masten 1988). Full price visibility auctions tend to attract suppliers that seek market intelligence and hope to attract new business, but it may deter those that want to keep their pricing confidential and resent the pricing pressure of such formats. With partial price visibility formats, suppliers are able to maintain a level of confidentiality around their prices, and there is less explicit pressure to compete on this basis. Moreover, bidding momentum does not need to be lost in a partial price visibility auction. If a supplier recognizes that its bid is ranked fourth in an auction, the supplier can still be motivated to bid aggressively enough to improve its ranking. Given the opportunity for more information privacy and the preservation of bidding momentum, I expect that opportunism suspicions, overall satisfaction, and continuity expectations will improve with the use of partial price visibility auctions compared with full price visibility auctions because there is less revelation of private values and the format may be less stressful.

P₄: Partial price visibility formats in online reverse auctions have a more positive impact on the interorganizational relationship than full price visibility formats.

Another key aspect of the auction mechanism is the rules for determining a winner, which I broadly classify into those that are buyer determined and those that are auction determined. Before the auction, suppliers are told that either the buyer retains full latitude to select the winner on any basis (this is the buyer-determined award rule) or the lowest or second-lowest price bidder in the auction will be declared the winner (this is the auction-determined award rule). The buyer-determined approach is often used when the intangible aspects of the product, such as quality, supplier reliability, and so forth, play a role in the procurement decision, whereas the auction-determined approach is more typical when the products are fairly comparable and the primary driver of the procurement decision is price.

The use of a buyer-determined or auction-determined award rule could affect the relationship in different ways. On the one hand, suppliers may believe that an auction-determined award is fairer and more explicit than a buyer-determined award. This belief arises because the supplier has information about the array of competitive bids and can understand how competitive its bid was in determining the award. On the other hand, with a buyer-determined award, buyers are able to view the whole array of bids and may pick the winning supplier on any basis; the buyer is not bound to choose the lowest bid as the winner. In this scenario, it is impossible to determine how the winning sup-

plier is selected because, in general, suppliers do not receive feedback about how the buyer weighs various attributes in the selection process. Thus, the ability to map efforts onto outcomes has a positive impact on the relationship compared with the more ambiguous buyer-determined award rule. I expect that the use of an auction-determined award rule will lead the supplier to be less suspicious that the buyer is acting opportunistically, more satisfied with the overall relationship, and willing to stay in the exchange in the future because the mechanism for selection is explicit.

P₅: Auction-determined award rules in online reverse auctions have a more positive impact on the interorganizational relationship than buyer-determined award rules.

A potential counterargument is that a buyer-determined award is preferable to an auction-determined award in that the buyer is better able to take the supplier's intangible benefits into account (e.g., prior experience and understanding of the buyer's operations, ability to work cooperatively with the buyer) and factor these benefits into the selection of a winning bidder. Thus, suppliers may believe that a buyer-determined award rule ensures a better representation of their true value to a buyer than an auction-determined award rule. If this is true, the logical consequence is that the buyer-supplier relationship would be improved when a buyer-determined award rule is used. This reasoning assumes that buyers have an accurate understanding of the differential value of each supplier, but this could be errorful. Because of this, I believe that auction-determined award rules have a more positive impact on the interorganizational relationship than buyer-determined award rules.

Event dynamics. The event dynamics, or price movement over the course of the auction, may not be directly controlled by the buyer, but they can have a significant impact on the subsequent buyer-supplier relationship. This is operationalized as the magnitude of the price savings that the auction generates. Although price savings are also a process outcome, they are a good indicator of event dynamics because they capture the magnitude of price variation. Stein, Hawking, and Wyld's (2003) recent case study describes the reaction of an incumbent supplier in an event. The supplier conducted research to identify the existing contract value (\$1.6 million) and identified a bottom-line position (a margin of 12%). Within the first seven minutes, the reserve was driven down \$90,000 (a 7% drop), and by the completion of the event, with only three bidders left, the lowest bid price dropped below the supplier's bottom-line position. "The managing director became caught up in the auction dynamic as he did not want to lose to other bidders," and by the end of the auction, the supplier's lowest bid had reduced its margin to 5%. "The managing director took about two weeks to get over losing to the competition" (Stein, Hawking, and Wyld 2003, p. 13). This scenario demonstrates how online reverse auction dynamics can demotivate and dishearten incumbent bidders.

In particular, participation in online reverse auctions may be more involving than face-to-face negotiations because of time compression, the availability of competitive pricing information, and the explicit level of competition. Bidders tend to focus on the electronic environment and

forget the broader context of the marketplace and competitive context, thus giving a disproportionate amount of attention to the pricing aspect of the contract and overweighing its role in the buyer's sourcing decision. This dynamic, as indicated by a significant drop in price, can be alarming and can result in negative attributions about the other bidders and the buyer if the price drops to a level that is not credible (given the supplier's knowledge of the industry and competition). The supplier might infer that the buyer has included unqualified suppliers and is using the auction opportunistically to wrangle additional price concessions from it. This may have a demotivating effect on the supplier, lowering satisfaction with the overall relationship and expectations of continuing exchange in the future.

P₆: As the price savings in an online reverse auction increases, there is a negative impact on the interorganizational relationship.

Methodology

Procedure

The foregoing predictions are examined through the use of a quasi-experimental design (Cook and Campbell 1979) administered across the supply bases of four *Fortune* 100 firms in the automotive, chemicals, consumer products, and high-tech industries. Each firm was offered customized analyses and a summary report in return for its participation. Each firm identified between two and nine auction events and allowed me to survey suppliers before and after these events occurred. As an independent observer of these auction processes, I was not allowed to intervene in these events; for example, I was not able to create untreated control groups or matched pairs of events or to interview the participants.

Data collection. The data collection involved a non-equivalent quasi-experimental design using pretest and posttest measures from the same panel of suppliers. Because quasi experiments involve nonrandom assignment of the participants to conditions, I tried to enhance generalizability by replicating the design approach across 25 product categories. The buyers provided the names and e-mail addresses of suppliers invited to participate in an upcoming bid event and the auction design characteristics specific to their event. One week before the auction, suppliers were e-mailed an invitation to complete the pretest survey at a university Web site. The invitation also guaranteed individual anonymity and reassurance that the buyer would not have access to individual responses. Suppliers completed all items in reference to the specific buying organization and upcoming auction event; that is, they supplied perceptual measures of their relationship with the buyer. During the week following the auction, suppliers were sent an e-mail invitation to complete a posttest survey that contained essentially the same measures as the pretest survey. At the time of the posttest, suppliers in the auctions with buyer-determined award rules did not yet know whether they had won the auction event, which implies that their posttest scores are a direct function of the auction process. Each buying firm was also monitored to ensure that no major

events or initiatives occurred at the time of the auctions that might disrupt or alter supplier perceptions and attitudes.

Sample. The total purchase contract value across the 25 auction events was \$385 million. The products included various direct (e.g., hoses, pulleys, subassemblies, cables) and indirect (e.g., mechanical equipment, copy paper, pallets) materials.⁶ The events varied in the nature and level of treatment effects. Specifically, the mean number of bidders across these events was 10.6 (SD = 7.5, range = 4–35). The average value of the purchase contract was \$16 million (SD = \$24 million, range = \$880,000–\$102.9 million), and the mean number of lots was 4.9 (SD = 3.7, range = 1–15). The average savings (the percentage drop in price over historical prices) generated from the auctions mean was 25% (SD = 18.9%, range = 0%–57%). Four events used an auction-determined award rule, and seven events used partial price visibility formats. This implies that 21 events used a buyer-determined award rule, and 18 events were full price visibility formats.

Respondents from supply organizations were the primary points of contact for the buyer; these people included senior executives, sales representatives, vice presidents, and business owners who handle large customer accounts. These people had the authority to make price concessions and determine major investment decisions. Two hundred sixty-four suppliers across the 25 events were invited to complete the survey, and 125 suppliers responded, generating a response rate of 61%. Of these respondents, 81 were incumbents, and the rest were new suppliers to the product category.

Because the propositions rely on supplier perceptions, respondent competency was assessed with both global and specific measures. The global measures included the number of years the respondent had been with the supplier firm and the number of years the respondents had been in their current positions. These means were 7.9 (SD = 6.8, range = .4–30) and 4.6 (SD = 4.2, range .25–21), respectively. The respondents also had extensive online reverse auction experience, having participated in an average of 12 (SD = 7.8, range = 4–35) auctions. Specific measures were also used to assess the respondents' knowledge of their firms' relationship with the buyer. Respondents were asked, "How knowledgeable are you about the following aspects?" The following statements were then listed below the question: "your firm's willingness to work with this buyer," "the state of your firm's relationship with this buyer," "your firm's willingness to invest in this customer," and "your firm's attitude toward this buyer." The mean response to these items on a seven-point scale (1 = "hardly knowledgeable," and 7 = "very knowledgeable") was 6.4 (SD = .7, range = 3.3–7). Collectively, these measures provide some confidence that the respondents were knowledgeable, relatively involved in the survey, and unlikely to have fabricated answers to the items. In other words, they were qualified key informants (Van Bruggen, Lilien, and Kacker 2002).

⁶Indirect materials are goods that are not used in production, whereas direct materials are those that are used directly in the manufacturing process.

To minimize the possibility that respondents might try to create socially desirable responses and skew the results, I did not reveal the specific issues examined in this research and mixed up the multi-item measures to make it difficult for respondents to manipulate the data and my interpretations. Whenever possible, I also supplemented the survey data with additional interviews with various participants to obtain a richer sense of the organizational environment in which these auctions were being conducted.

Measurement

The interorganizational relationship is measured with multi-item scales (1 = “strongly disagree,” and 7 = “strongly agree”). All the scales were adapted from prior research. Specifically, the scale items for overall satisfaction were adapted from the work of Ruekert and Churchill (1984), and the scale items for opportunism suspicions and continuity expectations were adapted from the work of Jap and Anderson (2003). Measures of overall satisfaction with the relationship and continuity expectations were completed by incumbent suppliers because new suppliers would have no basis for completing these measures. Table 1 provides an overview of the means, correlations, standard deviations, and reliabilities of these constructs, and the Appendix displays the specific items.

The mean value of opportunism suspicions is relatively low ($M = 2.8$, $SD = 1.3$, minimum = 1, maximum = 6). This value is not unusual, particularly in established relationships (Heide 1994). Although firms may devise relational safeguards to protect against opportunism, its presence in exchange is never zero (Williamson 1993). However, opportunism cannot be too high or else the parties would not transact.

A measurement model is estimated using maximum likelihood techniques in LISREL 8.54 (Jöreskog and Sörbom 1993). The model is composed of three first-order constructs of latent factors (opportunism suspicions, overall satisfaction with the relationship, and expectations of continuity), including the observable indicators, measurement errors, and intercorrelations between the constructs.

The chi-square fit index for the model is 311.61 (d.f. = 62). The comparative fit index and incremental fit index are .87, and the Tucker–Lewis index is .83. The root mean square error of approximation (RMSEA) is .19. Although comparative fit index, incremental fit index, and Tucker–Lewis index values of .9–1 are typically recommended, in sample sizes of less than 200, these indexes are unlikely to achieve this rule-of-thumb benchmark (Bearden, Sharma, and Teel 1982; Marsh, Balla, and Hau 1996; Marsh, Balla,

and McDonald 1988). All the factor loadings and measurement errors are in acceptable ranges and are significant at $\alpha = .05$, providing evidence of convergent validity. Discriminant validity is stringently assessed with the procedure that Fornell and Larcker (1981) recommend. Each pair of constructs passes this test. Collectively, these indexes indicate a good fit of the model to the data.

Analysis

Because the predictions describe the impact of specific design variables on the relationship at large, I regress the predictors on the three aspects of the relationship (beliefs, evaluation, and expectations) collectively with a hierarchical multivariate analysis of variance and test for general effects. This test addresses the omnibus relationship between the two concepts and shows that it is consistent with theoretical assumptions. Having tested for the general effect, I then consider the individual effects to help understand what is driving the general result and inform the understanding of how they are related to the dependent variables of interest. This is done in a two-stage fashion in which covariates are estimated only in the first step, and then the main effects of auction design are added in the second step to give a clear understanding of the incremental variance explained by inclusion of the auction design variables.

The quasi experiments are a nonequivalent design, which means that the expected values of at least one characteristic of the groups are not equal even in the absence of a treatment effect. In other words, various factors could affect the posttest scores across the 25 events. I account for these differences by separating them from the treatment effects (e.g., the number of buyers and lots) using a multivariate analysis of covariance (MANCOVA) model in which the impact of the treatment effects is estimated for the group of interorganizational relationship characteristics, and various covariates are included to adjust for initial differences that could affect the posttest scores. These covariates include the purchase type, supplier type, and the respondent’s pretest score. Purchase type is a dummy variable that reflects the type of materials purchased in the auction, whether they are materials used directly in the firm’s manufacturing processes or indirect materials that are not used in the firm’s product manufacturing efforts; two of the auctions procured indirect materials. Supplier type is a dummy variable that indicates whether the respondent represents an incumbent or a new supplier. The final covariate is the respondent’s pretest score on the dependent variable of interest. The general form of the model is as follows:

TABLE 1
Construct Means, Correlations, and Reliabilities

Construct	M	SD	Minimum	Maximum	1	2	3
1. Suspicions of opportunism	2.37	1.10	1	6	.92		
2. Overall satisfaction with the relationship	4.80	1.04	2	7	-.41	.87	
3. Expectations of continuity	5.69	1.20	1	7	-.10	.34	.84

Notes: The -.10 correlation is not significant. Construct reliabilities are provided in bold in the matrix diagonal.

$$(1) \text{ Posttest score} = \alpha_0 + \beta_1 \text{Number of bidders} \\ + \beta_2 \text{Contract value} + \beta_3 \text{Number of lots} \\ + \beta_4 \text{Price visibility} + \beta_5 \text{Award rule} \\ + \beta_6 \text{Price savings} + \beta_7 \text{Supplier type} \\ + \beta_8 \text{Purchase type} + \beta_9 \text{Pretest score} + \epsilon_1,$$

where

Posttest score = interorganizational relationship aspects (i.e., opportunism suspicions, overall satisfaction, and continuity expectations),

Number of bidders = the number of a specific event,

Contract value = the dollar amount of the purchase contract,

Number of lots = the number of lots in a specific event,

Price visibility = dummy for full visibility (0) and partial visibility (1),

Award rule = dummy for buyer-determined (0) and auction-determined (1),

Price savings = percentage of price savings generated by a specific event,

Supplier type = dummy for current suppliers (0) and new suppliers (1),

Purchase type = dummy for direct materials (0) and indirect materials (1),

Pretest score = the value of the supplier attitude toward the auction or buyer before the auction,

α_0 = the intercept,

β_{1-9} = the coefficients for the auction structure elements and covariates, and

ϵ_1 = the error term for the model.

This model matches the covariates to the predicted posttest value for all levels of the auction design elements and examines the differences between them. Note the inability to account for potential dependencies among supplier responses in a specific auction because of the limited sample size. A Breusch–Pagan test for heteroskedasticity was not significant ($\chi^2_{(1)} = 1.18, p < .28$), indicating that heteroskedasticity may not be problematic in this sample. A clustering of observations and estimation through a Huber–White sandwich estimator of variance is inconclusive, because each auction is treated as an independent observation and the resulting statistical power is low. It is also not possible to estimate a fixed-effects model because of collinearity with the design variables, and I did not have suitable data for an instrumental variable estimation approach.

Some readers might be concerned that suppliers would be naturally biased in their attitudes toward the buyer or auction. For example, suppliers may regularly suspect buyers of being opportunistic or may overstate their willingness to be responsive or their expectations of the future. Such biases would increase the observed scores. Even so, it is important to note that such biases would operate within both the pretest and the posttest but would not explain a sig-

nificant relationship between the scores, which is the focus of this research.

Results

Table 2 displays an overview of the Stage 1 and 2 results. In the first stage, the covariates of purchase and supplier type and the pretest scores account for 26%, 7%, and 3% of the variance in opportunism suspicions, overall satisfaction, and continuity expectations, respectively. However, the Stage 2 results indicate that when the effects of auction design—the number of bidders, economic stakes, and auction mechanism—are added to the regression, the variance explained jumps to 51% for opportunism suspicions, 29% for overall satisfaction, and 18% for continuity expectations, suggesting that auction design (and the resulting experience from the design choices) plays a significant role in explaining interorganizational outcomes.

Test of Predictions

P₁ considers the relationship between the number of bidders and the interorganizational relationship. The MANCOVA indicates that, in general, the effect of the number of bidders and the interorganizational outcomes is positive and significant ($F_{3, 111} = 16.84, p < .0001$), which does not support P₁. To understand this effect better, I find that the number of bidders has a significant, positive impact ($\beta_1 = .05, p < .01$) on opportunism suspicions, consistent with my prediction that increasing the number of bidders increases participation and may be viewed as the buyer opportunistically attempting to squeeze further price concessions from suppliers. It is surprising that the number of bidders had a significant, positive impact ($\beta_1 = .05, p < .01$) on satisfaction. It could be that when suppliers recognize that there are a critical mass of bidders that can quote competitively, they perceive the buyer as doing its due diligence to keep its procurement prices in check; indeed, a few other suppliers may be a credible signal that the buyer knows the other realistic alternatives and has included those suppliers in the event.⁷ However, this argument suggests that too few or too many bidders is not credible. Thus, I estimate a regression in which I add a curvilinear effect of the number of bidders; this parameter estimate is positive and significant ($\beta_{12} = .01, p < .00$). A plot suggests that satisfaction increases as the number of bidders increases to approximately 12.2 bidders per event on average and then drops thereafter, consistent with this possibility.

P₂ and P₃ examine the impact of the contract value and number of lots on the interorganizational relationship. The MANCOVA indicates that the value of the event has a positive, significant impact ($F_{3, 111} = 3.04, p < .03$) on the inter-

⁷In independent interviews with suppliers, they reported that when they know that there are only two to three alternative suppliers in the world and then find five or six suppliers bidding in the auction, they suspect that the buyer has included some unqualified bidders to drive down the price unfairly. In this sense, the number of suppliers can be an important indicator of the buyer's opportunism.

TABLE 2
Hierarchical Regression Results

Stage 1 Regressions	Posttest Dependent Variables					
	Opportunism Suspicions		Overall Satisfaction		Continuity Expectations	
	Estimate	SE	Estimate	SE	Estimate	SE
Intercept	2.48	.81**	4.77	.76***	6.27	.57***
Supplier type	-.42	.23*	.33	.22	-.13	.16
Purchase type	.64	.39	-.63	.70*	-.45	.28
Pretest opportunism suspicions	.50	.11***	-.09	.10	.00	.08
Pretest overall satisfaction	.18	.12	.12	.12	.08	.09
Pretest continuity expectations	-.32	.09***	.00	.09	.01	.07
R ²	.26		.07		.03	
Stage 2 Regressions						
Intercept (β_0)	2.07	.73***	4.05	.75***	5.24	.58***
Number of bidders (β_1)	.05	.01***	.05	.01***	.00	.01
Contract value (β_2)	-.01	.01	.02	.01***	.01	.01***
Number of lots (β_3)	.09	.03***	-.07	.03**	.06	.03**
Partial price visibility (β_4)	.47	.32	1.02	.33***	-.11	.26
Winner determination (β_5)	.16	.43	.14	.44	.37	.34
Price drop (β_6)	.00	.01	-.02	.01***	.00	.00
Supplier type (β_7)	.19	.21	.16	.22	-.13	.17
Purchase type (β_8)	.43	.47	-.33	.48	-.58	.37
Pretest opportunism suspicions (β_9)	.21	.10**	-.04	.10	-.04	.08
Pretest overall satisfaction (β_{10})	-.01	.11	.15	.11	.01	.09
Pretest continuity expectations (β_{11})	-.28	.10***	.14	.10	.16	.08**
R ²	.51		.29		.18	

* $p < .10$.
** $p < .05$.
*** $p < .01$.

organizational relationship overall, as does the number of lots ($F_{3, 111} = 8.95, p < .0001$), in support of P_2 and P_3 . The Stage 2 regressions indicate that these effects are due to a significant, positive effect of the contract value on overall satisfaction ($\beta_2 = .02, p < .01$) and continuity expectations ($\beta_2 = .01, p < .01$), consistent with my expectations that as the economic stakes increase, the impact on the relationship is more positive. It is surprising that the impact of number of lots is mixed. There is a significant, positive effect of the number of lots on opportunism suspicions ($\beta_3 = .09, p < .01$) and continuity expectations ($\beta_3 = .06, p < .03$) but a significant, negative effect on overall satisfaction ($\beta_3 = -.08, p < .03$). It may be that the positive effect of lot number (i.e., the creation of more and varied opportunities for participation) is limited; that is, beyond a certain range, more lots make the bidding task cumbersome. To assess this possibility, I add a curvilinear effect of the number of lots to the regression. This term has a positive, significant impact ($\beta_{12} = .02, p < .01$) on continuity expectations and a significant, negative effect on opportunism suspicions ($\beta_{12} = -.01, p < .04$). A plot reveals that the impact of the lot number reaches its nadir at seven lots for opportunism suspicions and peaks at six lots for continuity expectations.

P_4 suggests that partial price visibility formats are positively related to the interorganizational relationship. The results support this prediction; there is an overall significant, positive impact ($F_{3, 111} = 3.38, p < .02$) of partial price

visibility formats on interorganizational outcomes. The Stage 2 results indicate that partial price visibility formats have a significant, positive effect on overall satisfaction ($\beta_4 = 1.02, p < .01$). Consistent with this, a Duncan multiple range test of mean differences reveals significant differences in the levels of overall satisfaction across full and partial price visibility formats. Specifically, overall satisfaction with the relationship is higher in events with partial visibility formats (5.38) than in events with full price visibility formats (4.64). A regression that breaks out the two types of partial visibility formats suggests that the positive impact on satisfaction is primarily driven by the rank format ($\beta_{12} = 1.17, p < .01$) and is only marginally related to the low-price format ($\beta_{13} = .91, p < .10$).

P_5 considers the possibility that winner determination rules affect the interorganizational relationship. There is no significant empirical support ($F_{3, 111} = 1.65, p < .18$) for this prediction in the MANCOVA, and its effect was not significant in all the individual regressions.

P_6 suggests that the price savings generated over the course of the online auction event are negatively related to the interorganizational relationship. The results support this prediction; there is a significant, negative effect ($F_{3, 111} = -3.87, p < .01$) of the drop in price on interorganizational outcomes. The Stage 2 regressions indicate that this may be due to a significant, negative impact ($\beta_6 = -.02, p < .01$) on overall satisfaction.

Potential Interactions with Winner Determination Rules

The preceding results suggest that winner determination rules are not related to outcomes. I consider the possibility that winner determination rules could interact with various auction design characteristics further to affect opportunism suspicions. For example, it may be that auction-determined award rules are viewed as fairer than buyer-determined award rules because winner determination is more explicit (low price). In contrast, in buyer-determined auctions, bidders would compete more aggressively on nonprice attributes, such as relationship- or trust-building activities, and could use the auction to their advantage (e.g., survey prices without bidding aggressively). This would imply that the negative impact of number of bidders and full price visibility formats might be mitigated in auction-determined events because the selection of a winner is explicit. By this same reasoning, the positive impact of higher auction stakes (i.e., the number of lots and contract value) could be enhanced in auctions in which winners are determined by price alone.

When the three interaction terms are added to the regressions, the R-square of opportunism increases to .56 (from .51 without the interaction terms). The interaction of award rule with number of bidders is not significant ($\beta_{12} = -.06, p < .84$). The interaction of award rule with number of lots and price visibility attributes is significantly related to opportunism suspicions. Specifically, the results suggest that the use of auction-determined award rules and an increasing number of product lots are negatively related ($\beta_{12} = -.52, p < .02$) to suspicions of opportunism, suggesting that more lots provide more opportunities to participate and allow for specialization, which, together with the explicit award rule, improves perceptions of fairness. However, the use of auction-determined award rules and full price visibility formats are positively related to opportunism suspicions ($\beta_{12} = 2.48, p < .05$). It may be that the use of auction-determined award rules is unable to mitigate the negative impact of full price visibility competition, and instead the combination of these two attributes heightens suspicions of opportunism. This is consistent with the possibility that the explicit nature of the auction format, in terms of both how the winner is selected and the full range of information on bids, creates a price focus at the expense of intangible attributes, such as quality, responsiveness, and other forms of buyer support.⁸

Potential Interactions with Supplier Type

I also consider the possibility that interactions exist between supplier type and auction design effects, such as the event value, number of bidders, and price drop. For example, as the value of the event increases, incumbents may be more motivated to participate, thus increasing their satisfaction and responsiveness toward the buyer. Incumbents may also

be more threatened as the number of bidders increases, thus having an adverse effect on interorganizational outcomes. As the price drops, incumbents may feel more threatened than new suppliers. However, none of these interactions have a statistically significant impact on the interorganizational relationship.

Discussion

Collectively, the results demonstrate that online reverse auction design through the participants, stakes, format, and event dynamics are systematically related to interorganizational outcomes, suggesting that the buyer's auction design choices can be an important strategic variable in managing its relationships with the supply base. The analysis points to four key results.

First, as the number of bidders in an online reverse auction increases, participation, bidding, and savings in the auction increase, creating pressure on suppliers to lower their margins to retain or win new business. Thus, suspicions of opportunism increase because suppliers infer that the buyer has made a strategic choice to raise the level of price competition (and increase the likelihood of lower supply margins). In addition, the number of bidders, up to approximately 12 bidders per auction, has a positive impact on overall satisfaction. It may be that the number of bidders provides a credible signal to suppliers that the buyer invited credible supply alternatives to the auction. Beyond this point, an increase in the number of bidders may suggest to suppliers that some bidders are unqualified supply sources and are included only to drive price down unfairly, and as a result, satisfaction is adversely affected.

Second, stakes matter; as the size of the purchase contract increases, the interorganizational relationship is enhanced through heightened overall satisfaction and continuity expectations. This can happen by purchasing greater volumes, enabling suppliers to recoup any margin losses through economies of scale. In addition, increasing the number of lots provides multiple opportunities for suppliers to participate in the event and provide compelling purchase configurations for the buyer within limits. By having approximately six to seven lots in an event, the buyer can decrease opportunism suspicions and improve continuity expectations. With too few lots, the economic stakes are not worthwhile, and with too many lots, the bidding task becomes cumbersome.

In addition, I find that though the main effect of award rule is not significantly associated with interorganizational outcomes, its impact is contingent on other factors, such as the number of lots in an auction. In this case, as the number of lots increases and an auction determined award rule is used, opportunism suspicions are reduced. This may be due to the increased opportunities for suppliers to participate and specialize as well as a clear mapping of how winners are selected. The net result of all these effects may be to improve the supplier's disposition toward the buyer, its willingness to be supportive, and its expectations of the future.

Third, partial price visibility formats in online reverse auctions are gentler on the interorganizational relationship and have a greater impact on overall satisfaction than full

⁸As a check, I considered whether the interactions of award rule and design characteristics were related to overall satisfaction or continuity expectations, but these effects were not significant.

price visibility formats. It may be that an intermediate level of price visibility is less threatening in that the supplier's specific bids are not available to competitors; thus, the supplier's private thoughts about the true market value of the contract are not revealed. Consistent with this, suppliers in the partial price visibility condition have lower suspicions of opportunism, and the incumbent's overall satisfaction with the relationship is significantly greater than that of suppliers that participated in full price visibility auctions. The overall pattern of results is consistent with that of Jap (2003), who compares full price visibility formats with no price visibility (sealed-bid) formats and finds that full price visibility formats can adversely affect the interorganizational relationship.

Despite these positive effects, there is a dark side to these auctions. The results suggest that increasing the number of bidders or having too few or too many lots can raise opportunism suspicions. In addition, the use of an auction-determined award rule together with full price visibility bidding formats can hurt relationships by raising suspicions of opportunism. Collectively, these effects may be due to the notion that online reverse auctions are never completely transparent: Bidders never know exactly who they are competing with or the specific motivation behind how and why various lots are grouped together. This "noise" in the system, particularly when compounded by a focus on price, may lead suppliers to assume that the buyer is using these conditions to its advantage. More research into the effectiveness of various bidder selection, lotting strategies, and alternative award rules would enhance the understanding of these aspects.

Fourth, the auction event dynamics can affect the buyer-supplier relationship. Specifically, the more the price drops in an event, the more significantly negative is the impact on the relationship. High cost savings in an online reverse auction event may translate into decreased margins for suppliers and reduced supply opportunities because the price level prohibits their ability to supply the buyer effectively. Incumbent suppliers may believe that the buyer is using the auction to opportunistically wrest price concessions from them, thus reducing their overall satisfaction with the buyer. To my knowledge, this is the first study to show that the price dynamics in an event affect the interorganizational relationships related to the event. This underscores the notion that technology-enabled processes do not operate in isolation but can have a systematic impact on auction participants' beliefs, expectations, and current performance.

Limitations

There are limitations to the research. For example, this study could have considered many more aspects of online reverse auction design and many more interorganizational outcomes, but this work represents a first step in better understanding the interface between online technologies and the interorganizational relationship. However, much remains to be considered. Another limitation might be that the research considers only the perspective of the supplier and does not account for the buyer's perspective. A dyadic

approach would have been preferable, though the participating companies would not allow this option.

Still another limitation includes the types of data I was able to glean from the field sites. For example, I was not able to determine and incorporate information about the actual winner or loser of each event into the analysis. It would have been helpful to control for this aspect in auctions using an auction-determined award rule. In the case of buyer-determined auctions, it can often take four to six weeks to determine the final winner. Thus, this delay actually enabled a clearer understanding of the impact of the auction process on interorganizational outcomes. Another example of data that would have been beneficial to this study is process measures, such as the number of bids submitted by a particular bidder, the rate of price declines, the length of the bidding process, and so forth. However, the availability of such data was limited by the field sites.

A final limitation is the sample size. It would have been helpful to survey many more suppliers across more product categories, industries, and environments. However, the quasi-experimental approach requires an extraordinary amount of effort to administer surveys before and after the auction events because auctions are regularly scheduled (and rescheduled) and reconfigured over time. Furthermore, because the auctions contain data about a sensitive issue—namely, the buyer's procurement pricing—they require a high level of clearance and endorsement from the buying organization to observe and obtain these data.

Implications for Management

An ongoing challenge in many buying organizations is the incorporation of e-commerce tools, such as online reverse auctions, into a coherent sourcing strategy. At one level, buyers wrestle with pressure from upper management to secure the lowest price possible, but they must also understand the valuable role of long-term relationships and strategic partnerships. It is becoming increasingly clear that success in industrial sourcing will be inherently linked to the success of the supply base and the struggle to balance new opportunities and emerging technologies with long-term results.

In general, buyers should strive for events with large contract values and use partial price visible formats to safeguard their supply relationships. This approach provides the financial motivation to participate and some level of pricing confidentiality without necessarily needing to sacrifice bidding aggressiveness.

However, the current research suggests that conducting online reverse auctions that preserve interorganizational relationships is a delicate balancing act. To avoid raising opportunism suspicions, buyers must consider the number of suppliers and lots. Too few or too many suppliers or lots will have damaging effects on their supply relationships. Opportunism suspicions can also be avoided by coupling auction-determined award rules with a large number of lots or partial price visibility formats.

Finally, the event dynamic can play a critical role, and this may be largely beyond the buyer's control. Specifically, although the buyer can attempt to preserve and enhance its

relationships with the supply base through auction design, the use of these auctions exposes a key trade-off between price savings and supply relationships (see Jap 2003). The greater the price savings extracted in these auctions, the more likely the relationships will be adversely affected. The challenge is for buyers to manage the process such that enough savings can be generated to make the process worthwhile from their perspective, while cushioning the impact on the interorganizational relationship through smart design.

Directions for Further Research

This research represents a starting point for future work on the impact of online reverse auctions on buyer–supplier relationships. A fruitful avenue for research would be to evaluate the long-term implications of using multiple online reverse auctions on actual supplier behavior and performance over time from the buyer’s perspective. Can the use of online reverse auctions improve relationships over time by adding a sense of fairness and objectivity to the industrial sourcing process, or do the auctions create resentment, undermine motivation, and encourage retaliation in the long run?

Another important direction would be to understand better what leads suppliers to bid aggressively in online reverse auctions. It is possible that “smart” aggressive bidding—bidding aggressively when there is a true payoff from doing so as opposed to bidding aggressively because of an overestimation of the contract (i.e., the winner’s curse) or getting caught up in the bidding fever—could have a less negative effect on the interorganizational relationship. These issues and more are worthy of additional investigation.

Collectively, the results of this research indicate that the structure and design of online reverse auctions can exert complex relational effects on suppliers. Technology does not exist in isolation; its value in organizational contexts is fundamentally tied to the participants who interact with the technology in computer-mediated environments. By illumi-

nating the interplay between technology and the psychological effects on organizational participants, I have provided evidence of these effects and guidance on how to improve the design and structure of online reverse auctions.

Appendix: Scale Items

Suspicious of Opportunism

How likely is it that the buyer firm would do the following: (1 = “very unlikely,” and 7 = “very likely”)

- Make false accusations.
- Provide false information.
- Expect your firm to pay for more than their fair share of the costs to correct a problem.
- Make hollow promises.
- Be unwilling to accept responsibility.
- Be aloof toward your firm.
- Fail to provide proper notification.
- “Window-dress” their efforts to improve.

In the items that follow, “They” refers to the buyer firm, and “We,” “Our,” and “Us” refer to your firm. Please indicate the extent to which you agree or disagree with the following statements: (1 = “strongly disagree,” and 7 = “strongly agree”)

Overall Satisfaction with the Relationship

- Our relationship with them has more than fulfilled our expectations.
- We are satisfied with the outcomes of our relationship.
- Our relationship with them has been a successful one.

Expectations of Continuity

- We expect to continue working with them on a long-term basis.
- Our relationship with them will last far into the future.

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