ONLINE, REVERSE AUCTIONS: ISSUES, THEMES, AND PROSPECTS FOR THE FUTURE*

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ABSTRACT

Online, reverse auctions are increasingly being utilized in industrial sourcing activities. This phenomenon represents a novel, emerging area of inquiry with significant implications for sourcing strategies. However, there is little systematic thinking or empirical evidence on the topic. In this paper, the use of these auctions in sourcing activities is reviewed and four key aspects are highlighted: (i) the *differences* from physical auctions or those of the theoretical literature, (ii) the *conditions* for using online, reverse auctions, (iii) *methods for structuring* the auctions, and (iv) *evaluations* of auction performance. Some empirical evidence on these issues is also provided.

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INTRODUCTION

For nearly the past decade, managers, analysts, researchers, and the business press have been remarking that, "The Internet will change everything." And since the advent of the Internet, we have seen it challenge nearly every aspect of marketing practice. This raises the obligation to consider the consequences of the Internet to management practices, the theme of this special issue. Yet, it may take decades to fully understand the impact of the Internet on marketing practice, in general. This paper is one step in that direction. Specifically, I consider the impact of the Internet in a business-to-business context, the sourcing of direct and indirect materials from a supply base. It has been predicted that the Internet will bring about $1 trillion in efficiencies to the annual $7 trillion that is spent on the procurement of goods and services worldwide (*USA Today*, 2/7/00, B1). How and when this will happen remains an open question.

However, one trend that is showing increasing promise is the use of online, reverse auctions. Virtually every major industry has begun to use and adopt these auctions on a regular basis (Smith 2002). During the late 1990s, slow-growth, manufacturing firms such as Boeing, SPX/Eaton, United Technologies, and branches of the United States military, utilized these auctions. Since then, consumer product companies such as Emerson Electronics, Nestle, and Quaker have followed suit. Even high-tech firms such as Dell, Hewlett-Packard, Intel, and Sun Microsystems have increased their usage of auctions in sourcing activities. And the intention and potential for the use of these auctions to continue to grow in the future is clear. In their annual survey of purchasing managers, *Purchasing* magazine found that 25% of its respondents expected to use reverse auctions in their sourcing efforts. Currently, the annual throughput in these auctions is estimated to be $40 billion; however, the *addressable* spend of the Global 500 firms is potentially $6.3 trillion.

The popularity of online, reverse auctions can be attributed to three key factors. The first is that online, reverse auctions create immediate financial savings. These auctions have been shown to produce anywhere from 5-40% cost savings (Tully 2000), with 15% being more typical (Cohn 2000). When you consider that a major manufacturer procures billions of dollars worth of goods on annual basis, a 15% savings can have a huge impact on the bottom line. Another way to think about this is to realize that if a firm has a 20% gross margin, every $1 saved in procurement is the equivalent of adding $5 in revenue. The second factor in their rapid growth is the process efficiencies that auctions create. In the past, buyers would spend approximately *six weeks* from the time a request for purchase (RFP) is created to the point at which a set of viable bids are available for consideration. These six weeks are spent mailing, faxing, and delivering papers back and forth, numerous voice mails and phone conversations, with multiple rounds of bidding shepherded throughout the process. By holding the reverse auction online and employing electronic communications, this process can be reduced to the span of several hours. The third factor in the growth of these auctions is the enabling capabilities of emerging technologies. The technology behind an auction format is not complex; hence, many firms can offer them as part of their sourcing solutions or software (e.g., B2eMarkets, CommerceOne, Oracle). The technology also enables unprecedented temporal and geographical efficiencies, making it easier than ever to organize and host an online, reverse auction.

Clearly, the utilization of online, reverse auctions is here to stay and will continue to become an important aspect of sourcing activities in the future. However, this raises a myriad of issues regarding their role in procurement strategies. In virtually every industry, buyers are asking similar questions: What's new and different about online, reverse auctions? When should they be used? How should I set up an online, reverse auction? What suppliers should be invited to bid? How will they react to the format? How do I evaluate whether the auction is worthwhile? Will I save money

if I run an online, reverse auction? What will the long-term impact be, if any? Essentially, these questions can be boiled down to four key issues:

(i) *Differences*, from physical auctions or those studied in the theoretical literature,
(ii) *Conditions,* or when to use online, reverse auctions,
(iii)*Structure*, or how to use these auctions, and
(iv)*Evaluation,* or why the auctions should be used.

Together these aspects provide a perspective on the process of using online, reverse auctions in industrial sourcing activities. Buyers contemplate how online reverse auctions differ from past sourcing techniques, then consider when they should use the auctions, how the auctions should be used, and then evaluate whether the auction was worthwhile. To date, there is little systematic work on these issues. While there is a growing body of anecdotal stories and reports in the marketplace, the area remains ill defined and fragmented.

In this paper, I reflect on the role of online, reverse auctions in industrial sourcing activities by offering some perspectives on when they should be used, how they should be used and why the auctions are useful. The intention is to examine the marketplace phenomenon and provide a structured overview of the area with the goal of highlighting the advantages and disadvantages of these auctions and opportunities for research. There is not, however, an attempt to be exhaustive of the possibilities within each aspect.[1] The paper is organized as follows. In the next section, the various types of online, reverse auctions are discussed and differentiated from the physical auctions used in industrial purchasing and the auctions of the theoretical literature. This is followed by a description of the conditions for using auctions, considerations for structuring auctions, and evaluation issues. An overview of the discussion is provided in Figure 1. When appropriate, exploratory empirical results from a recent survey of industrial buyers are offered throughout the paper. Concluding remarks include additional long-term considerations and opportunities for additional research.

ONLINE, REVERSE AUCTIONS

SOME BASIC DEFINITIONS

Before beginning the discussion, it is useful to clarify some definitions and terms that will be used throughout the paper. To begin with, an *auction* is a market institution with an explicit set of rules determining resource allocation and prices on the basis of bids from market participants. In theoretical terms, auctions play a prominent role in the theory of exchange, as they remain one of the simplest and most familiar means of price determination in the absence of intermediate market makers. The auctions that are used in sourcing activities have been dubbed "reverse" to reflect the fact that *sellers* bid and the goal of these events is to push the price *down*. This is in contrast to the more common form of auction, the "forward" auction, in which buyers bid and the seller's goal is to push the price up. In this paper, the discussion will be restricted to the use of one-sided, online, reverse auctions, with "one-sided" referring to the fact that there is a single buyer instead of multiple buyers.

The format of online, auctions can be represented by two extremes: open vs. sealed bid formats. These formats vary along a price visibility continuum in which asynchronous, sealed bidding formats would anchor one end and simultaneous, open bidding formats would anchor the opposite end of the continuum. The term, "sealed" refers to the fact that only one supplier and the buyer has access to the details of a bid. The bid process is asynchronous in the sense that the buyer and supplier take turns viewing the bid. The buyer posts the RFP electronically, the supplier submits a bid, then the buyer views the submitted bid, and either makes a decision after viewing all bids or if multiple rounds of bidding are involved, the buyer may respond to the supplier who then resubmits a new bid. In contrast, an open bid event is one in which the buyer electronically posts an RFP and during the course of a designated time period (usually several hours), suppliers are invited

to bid simultaneously on the contract. In this situation, all suppliers and the buyer view the bids at the same time. This is why the process is referred to as "open."

Many open bid formats in industrial purchasing utilize a moving soft-close rule for ending the auction, instead of a hard-close rule. A hard-close rule, which is often used in forward auctions such as eBay.com, is one in which the end time is fixed. In contrast, a soft-close rule means that if there is a bid within a prespecified time period prior to the closing time of the event, then the real close time will automatically extend for a few minutes more to allow other bidders to respond. This will continue until a close time is reached with no bidding activity in the minute prior. The motivation behind this is to allow for price competition to run its full course, and to avoid "sniping," which is the practice of waiting until the last minute before the auction ends and trying to submit a bid which just barely beats the high bid and gives rival bidders no time to respond. With a hard-close rule, the event becomes essentially a sealed bid event, as all bidders submit their best bids without being able to view or respond to competitive bids.

OPEN BID ONLINE, REVERSE AUCTIONS

Figure 2 provides an example of the format of an open bid auction. Bid amounts are plotted on the vertical axis and time is plotted on the horizontal axis. A diamond indicates a supplier's bid, while a line connects the lowest bid at any point in time. The buyer's posted reserve price is the price at which it would be willing to move the purchase contract from an incumbent to a new supplier. This is essentially the buyer's switching cost, reflecting the risk that the buyer faces in moving the business. The pattern of bids in Figure 1 indicates that most activity occurs close to the scheduled closing time, and in this case, the buyer has chosen to use a soft close on this event. At this point, bidding becomes aggressive and the price falls dramatically over the next 30 minutes.

It is also worth noting that bids are being made above the reserve line throughout most of the auction. These represent price concessions by suppliers who may not be willing to bid at the market

lead. In many industrial auctions, the buyer may not necessarily commit to the lowest or second-lowest price bidder. Instead, it commits to select one winner among the bidders, but selection may occur on any basis other than price. This is the typical approach in product categories where additional non-price considerations are important such as the procurement of direct materials. As such, suppliers in the open bid event may bid above the market lead because they hope to remain in the buyer's consideration set by signaling a willingness to make some price concessions, while relying on their non-price value to justify their inability to offer the lowest prices in the market. Hence, while the open bid auction involves a dynamic competition on price, it is also an important signaling mechanism whereby all suppliers can make decisions regarding price concessions in real time.

DIFFERENCES FROM PHYSICAL AUCTIONS

The question often arises, "Are online, reverse auctions a new phenomenon or are they essentially the same type of phenomena as the manual auctions that have historically been used in sourcing activities?" The short answer is yes and no. Yes, there are many similarities; the goals of online and manual reverse auctions are to secure the best possible price on a particular good. Suppliers are often prequalified and invited to bid after viewing the RFP. However, the answer is also No, because there are many aspects of online, reverse auctions that are sufficiently different from manual auctions, such that they require a different type of management process from those in the past. These differences are classified as differences of *degree* and differences of *kind*. The former refers to aspects of the manual negotiation process that have been improved by emerging technologies, whereas the latter refers to aspects that are fundamentally different.

Differences in degree. Online, reverse auctions are generally cheaper and easier for buyers and auction providers to organize than manual auctions. Online technologies have enabled rapid and efficient forms of communication that allow buyers to invite more suppliers to events while

requiring less time to notify and organize these suppliers. And suppliers from all around the world can easily participate in the event without having to travel to a remote, physical location and congregate with other suppliers in order to bid. These technologies also enable auctioneers to provide immediate feedback to the bidder if there is a problem on the bid, whereas bidders in a manual auction process would not receive the feedback until the event is over.

Differences of kind. The negotiation format of manual versus online auctions is clearly different. In manual auctions, suppliers bid face-to-face, while in online auctions, suppliers use a computer mediated interface and the auctioneer provides the software that allow suppliers to make, modify, and view bids. Another significant difference is that the identity of suppliers in an online auction is typically anonymous, whereas in manual auctions, suppliers would be able to observe who their competitors are and what they are bidding. All of these characteristics combine to make the online, reverse auctions of today a different phenomenon than the manual auctions of the past.

DIFFERENCES FROM AUCTIONS IN THE THEORETICAL LITERATURE

The economics literature considers auctions from both a theoretical and empirical perspective, with a focus on the *process* by which individual actions translate into prices. Hence, this literature considers differences among the valuations that bidders may have for auction objects, characteristics of the bidder (e.g. risk averseness), psychological mistakes (e.g., the winner's curse) and how these factors affect the prices in a variety of auction formats (e.g., sealed, open, English, Dutch, etc.) that vary in their allocation rules. For an overview of this literature, see Milgrom (1989), McAfee and McMillan (1987), and Kagel (1995). Are the online, reverse auctions that we observe in the marketplace similar to or different from the auctions described in this large body of literature? At first blush, there appear to be a number of similarities between the marketplace and theoretical auctions; however, there are also a number of significant differences.

The similarities between marketplace and theoretical auctions include a focus on price bidding among competing sellers and the possibility of multiple buyers. The auctions are a tool in the determination of resource allocation and the format provides a structured space and well-defined rules along which bids may be offered. And for industrial auction events that are similar in format and assumptions to those of the economics literature, one would expect that the findings of this literature would be applicable. For example, in the sourcing of indirect materials[2], which include goods not used directly in the manufacturing process, many online, reverse auctions are similar to the theoretical literature. Hence, the results should generalize, although this has yet to be demonstrated (cf., Kagel 1995). There are, however, a number of significant differences that make it difficult, if not impossible, to generalize from the economics literature to many industrial settings.

Differences in degree. Many of the auctions in the theoretical literature involve commoditized products, for which price essentially determines the complete value of the product. In contrast, many marketplace auctions may involve products that, while largely determined by price, may also be differentiated by quality or other non-price attributes. For example, many marketplace auctions involve the purchase of direct materials, production materials for which aspects such as supplier quality and delivery may be important factors.

Differences in kind. One of the major differences between online, reverse auctions and those of the theoretical literature is that the vast majority of auctions used in the marketplace today do not determine a winner. The online, reverse auction is merely a mechanism for clearing suppliers on one basis, namely price, and the buyer may reserve the right to select the winner on any basis. In contrast, the auctions in the economics literature will explicitly specify *a priori* whether the winner will be determined on a first- or second-price basis. As a result, bidders in an open auction know exactly where they stand relative to their competitors and can use this information to determine how to respond to competitive bids. In online, industrial auctions where suppliers are not

told the buyer's selection rules, the suppliers may not have a real understanding of how competitive their offer was or even why they lost the purchase contract. In fact, it is not uncommon for suppliers to wait as long as 4-6 weeks before a winner is announced. And then there is often little feedback given as to how or why the contract was allotted.

A second major difference between online, reverse auctions in the marketplace and those of the theoretical literature is the fact that many marketplace auctions require suppliers to bid on a series of interdependent product lots. A lot is a sub grouping of parts; for example, a buyer may need to purchase 20 parts and will group these parts into 4-5 lots. By conducting an event with multiple lots, the buyer hopes to capitalize on supplier competencies and synergies in manufacturing or distribution while also creating a sizable contract value that motivates suppliers to participate. The division of parts into lots is a subjective decision of the buyer, who may divide them on the basis of the suppliers' capabilities to bid on or produce each lot, similarities in manufacturing processes, delivery regions, etc. Suppliers who bid on these parts will then bid on each lot sequentially over a multi-hour time period. However, it is important to note that the use of lotting practices in an auction event creates interdependence among the bids for various lots; the bids that are placed in the first lot may determine or impact the supplier's bids for the next lot, and the next and so forth.

When this interdependence of bids is combined with an award rule in which the buyer determines the winner, then bidding in an online, reverse auction can become a very complex proposition. From the supplier's perspective, it has a fixed capacity and cost structure that it attempts to account for in its bid in each lot. When the supplier doesn't know for certain whether it has won a lot, this decision process becomes extremely difficult, because it creates uncertainty about how and whether the supplier bids on the next lot. Interdependence among auction items has

yet to be examined in the economics literature; the closest related research considers multiunit purchases of homogenous commodities (Kagel and Levin 2001; Swinkels 2001).

To summarize, online, reverse auctions are differentiated from the manual auctions of the past in that the former enable geographic and temporal conveniences, and immediate bidder feedback that were not possible before. Additionally, suppliers in online auctions bid via a computer mediated environment and are typically anonymous to competing suppliers. Online reverse auctions are also differentiated from the auctions of the theoretical literature in that the former may involve the purchase of non-commoditized products, do not necessarily determine a winner, and is marked by an interdependent bidding process in which suppliers must allocate their fixed resources across heterogeneous product lots.

Together, these differences would suggest that (i) our prior understanding of how to manage the physical auction process and (ii) the findings and theories associated with the economics literature may not necessarily generalize to the online, reverse auction sourcing activities currently being witnessed in the marketplace. These auctions appear to be a fundamentally different phenomenon, both in degree and kind, than the manual auctions of the past or the auctions of the economics literature. This is not to say that there is no overlap or similarities to manual auctions or the auctions of the theoretical literature. And this does not imply that the insights generated in these areas are irrelevant to industrial, online, reverse auctions. Instead, the critical point is to realize that the dynamics and use of online, industrial sourcing auctions are very different from those of the past and it is important to carefully consider these differences when investigating this phenomenon.

It is also worth noting that the focus of my own interest in and subsequent comments on this topic also differs from that of the past. This paper is less concerned about explaining *how* bidders determine prices across a variety of auction formats and more concerned about the role of online,

reverse auctions within the broader organizational context. This is a critical direction of research that has been acknowledged and called for by researchers in the theoretical literature:

> The auction models are partial equilibrium models. The role of the price system in coordinating the actions of different people cannot be understood except within a general equilibrium system. How to embed bidding models in a general-equilibrium context remains an open question. Questions of the existence and social optimality of competitive equilibrium with informational asymmetries await the resolution of this question.
> – R. Preston McAfee and John McMillan (1987)

These experts point out that in practice, auctions do not occur in a vacuum. In fact, they are deployed into organizational settings that may systematically differ and these differences may interact with auction outcomes. Hence, more work is needed on understanding how auctions should be applied across specific organizational contexts, as such contexts could play a key role in the successful adoption and implementation of online auctions into industrial sourcing activities.

EXPLORATORY EMPIRICAL EVIDENCE

Systematic, empirical evidence on the role of online, reverse auctions in sourcing activities is scant. As a first step in better understanding this area, I recently conducted an exploratory survey of four Fortune 100 buying organizations in consumer foods, industrial chemicals, high-tech systems, and the automotive industries. Collectively, these four firms provided the name of 54 sourcing managers who were invited to complete an online survey. The survey directed the respondent to report on an online, reverse auction experience within the past two years and to complete all measures in regard to that specific auction event. Hence, the unit of analysis was a single auction event. The survey measured aspects of the conditions under which their auctions were held, how the auctions were structured, and the manager's evaluations of the outcomes of the auction.

The scales for multiple item measures were adapted from previous research or created specifically for the purposes of this study. Because of the limited sample size, a confirmatory factor analysis was not conducted, but an exploratory factor analysis was, to verify that the items did in

fact, load on a single factor. A complete listing of the items, constructs, and their coefficient alphas is displayed in Appendix 1.

Thirty-eight of the managers completed the survey, yielding a 70% response rate. These managers had on average, 5.2 (sd=5, min=1 max=24) years of experience in sourcing and had completed an average of 2.3 (sd=2.4, min=1, max=12) online, reverse auctions. The products that they reported on included steel parts, raw materials, components, piping, and sheets; these were primarily used directly in their production activities. Appendix 2 contains a complete listing of the products that were purchased through these auctions. 20% of the lots in these events involved the sourcing of new contracts. 78% of the auctions were open bid auctions, while the remaining 22% were sealed bid auctions. Hence, the results are skewed to reflect open bid auctions, although differences across the two formats are assessed; any significant differences are noted throughout the manuscript.

In the sections to follow, aspects of when, how, and why online reverse auctions are used in sourcing strategies are highlighted and the data is used to illuminate or illustrate the various concepts. The data set is small and primarily used for illustrative purposes; it should, however, be considered exploratory in nature.

CONDITIONS FOR ONLINE, REVERSE AUCTIONS

In recent years, *Purchasing* Magazine published an article entitled, "The E-Auction Playbook," which provided a number of marketplace perspectives on the use of online, reverse auctions in sourcing activities. These perspectives came from a variety of buying executives (e.g., Eastman Kodak, Sprint, United Technologies), purchasing and auction intermediaries (e.g., Chem Connect, Freemarkets, Moai Technologies, etc.), suppliers (e.g., ImageX.com), and consultants (e.g., CGEandY), with each firm offering up suggestions on when, how and why auctions should be used in industrial sourcing activities (*Purchasing* 2001). On the basis of this and many other

articles that have appeared on this topic and my own field interviews, research, and experiences with auctions in a variety of product categories, I consider three conditions that are particularly critical: product characteristics, sourcing strategies, and supply base characteristics. Research ideas and themes are sprinkled throughout the ensuing discussion in each section. These ideas, along with additional related issues, are summarized in Table 1.

PRODUCT CHARACTERISTICS

Price-based products. Products for which the purchase price constitutes the largest component of its value are ideally suited for online, reverse auctions. Examples of such products from the survey data include: cables, drives, metal parts, software, and switches. Additional examples can be found in Appendix 2. When the value of a product is easily expressed quantitatively, online auctions provide an efficient mechanism by which to rapidly evaluate all suppliers and set the purchase price. Under these conditions, the theoretical literature does much to inform this phenomenon. In the exploratory survey, respondents report that the products they put through auctions are ones in which on average, 83% of the total cost of ownership of the product (which includes aspects such as duty, freight, inventory, and carrying costs) are accounted for by the purchase price alone. When the products are commoditized, the capabilities of Internet-based technologies are particularly valuable; they enable unprecedented temporal and geographical conveniences that allow both players to benefit. Buyers are able to expand their reach into distant markets and avail themselves of new, alternative suppliers, while suppliers are able to bid on more events and attract new customers. Consistent with this, a correlational analysis indicates that as the product becomes increasingly price-based, buyers evaluate alternative suppliers more positively ($r=.53$, $p<.08$) and have greater expectations ($r=.62$, $p<.04$) of using them. This is the market mechanism at work.

Online auctions may, however, be inefficient for procuring products that are not price-based. In these cases, the marketplace's response has been to allow the buyer to reserve the right to determine the final price, but this creates complexities in bidding and an ambiguity around the allocation of resources through the auction. The online format, particularly in open bid auctions, also does not allow for the expression of non-price attributes. Thus, suppliers may find it difficult to express their intangible value and provide rich information to best meet the buyer's needs. For such products, face-to-face meetings and discussions may be a more efficient means for determining market pricing than an electronic auction. It is, however, worth noting that there are a number of companies who are currently developing the algorithms and software that will allow suppliers to express multiple attributes through online, reverse auctions. Thus, in the future we will likely see more non-price based products (e.g., strategic goods and services, customized components and designs, etc.) going through electronic auction formats.

Additional empirical evidence. The survey results indicate that the products being auctioned are mostly cost based. Forty seven percent of the products were in the mature stages of their lifecycles; this is more than twice the percentages in the introductory (19%), growth (18%), and decline (17%) phases respectively. The purchasing volumes of the product are also relatively stable. Specifically, 43% of the buyers indicate that purchasing volumes of the auctioned product are stable, while 30% report that their volumes are increasing and 27% report that their volumes are decreasing. Collectively, these results indicate that the types of products that go through online, reverse auctions are stable purchases of non-strategic products whose value is primarily based in the purchase price.

SOURCING STRATEGIES

When a buyer hosts an auction, it does so against a backdrop of an ongoing, sourcing strategy. This strategy may include strategic sourcing efforts, an attempt to aggregate volumes, re-

engineer the supply chain, or open the supply base to more suppliers. And in recent decades there has been a growing emphasis on relationship development strategies in which buyers and suppliers work more collaboratively to develop mutually beneficial, joint outcomes. Should auctions be used in these contexts? Let us consider the possibilities.

Strategic sourcing strategies. Buyers may follow a number of sourcing strategies, depending on the ultimate goals of the firm. For example, they might pursue a strategic sourcing process, in which the supply base is evaluated, managed, and processes are put in place to effect greater cost savings from the supply base configuration.[3] This process enables buyers to better understand the performance (or lack thereof) of each supplier in their supply base as well as the processes by which transactions occur with them. It also provides a framework for improving these processes (e.g., logistics, delivery, collaborative efforts) and managing the supply base so as to achieve greater cost savings. Alternative sourcing strategies that a buyer might pursue is one in which the volume expenditure of a product is aggregated across fewer suppliers or a strategy in which the buyer seeks to open the supply base to additional, new suppliers. All of these strategies are intended to help cut costs out of the sourcing process.

How auctions interact with these sourcing strategies remains an open question. One can imagine that online, reverse auctions may be a useful means by which to evaluate the price competitiveness of a supply base when buyers are attempting to consolidate their purchases across suppliers. One could also imagine that online, reverse auctions are useful when growing the supply base, as it enables the buyer to rapidly identify the price competitiveness of potential new suppliers. However, there is no research that has systematically examined this issue.

Another interesting issue would be to evaluate whether strategic sourcing activities or auctions have a greater impact in reducing the total cost of ownership of a product. Specifically, which achieves greatest cost savings in the sourcing of a product? (i) a strategic sourcing process,

(ii) an online reverse auction, or (ii) a combination of both an auction and a sourcing process. This can be answered from several different angles. On one hand, one could argue that a strategic sourcing process is the most comprehensive approach to reducing the total cost of ownership of the product because it optimizes the supply base structure to best support the transaction process. On the other hand, one could argue that online, reverse auctions are the most rapid means of getting to a supplier's "bottom line," and that this will have the greatest impact on cost of ownership. Of course, one could also argue that "more is more," and that the two approaches together would yield the greatest cost savings. Intuitively, this would seem to be the obvious answer, and in fact, I have witnessed many buyers who attempt to do both together. However, I have also observed that this approach does not yield incrementally greater results than doing only one or the other. It appears that suppliers are willing to give their best pricing in a strategic sourcing process *or* a reverse auction, but do not give significantly more when the two are used together.

This is consistent with an explanation by Wang (2000), who considers renegotiation costs in reverse auctions. Specifically, he develops a model with a first-price, sealed bid process that is followed by a renegotiation process. He proposes that bidding prices are marginally higher and welfare is marginally lower when renegotiation occurs than when it doesn't. This is because in general, suppliers have an incentive to bid higher when there is no renegotiation because they know that the bid price will be the final price. Moreover, suppliers with high costs will bid the same price regardless of whether renegotiation takes place, while suppliers with low costs will bid higher when renegotiation occurs and lower if it does not. In regard to welfare, he notes that renegotiation always leads to lower welfare as the procurer (who initiates the renegotiation) does not take into account the firm's loss in profit and efficiency due to renegotiation." This would suggest that renegotiation processes (e.g., auctions) when used in conjunction with other price setting activities or renegotiations (e.g., strategic sourcing) may yield only marginal improvements in key outcomes.

Relationship development strategy. During the 1990s, there was a growing interest in the crafting of relational exchanges in which buyers and suppliers could mutually benefit (Anderson and Narus 1991; Weitz and Jap 1995). Much emphasis was placed on the development of a long-term orientation, mutual trust and long-term commitment (Anderson and Weitz 1992; Ganesan 1994; Morgan and Hunt 1994) among the players. What happens when a buyer holds an auction while actively pursuing a relationship development strategy? It has been argued that open bid auctions are antithetical to collaborative relationship development strategies (Emiliani and Stec 2001). My own view is consistent with this; open bid formats can be detrimental to the development of supply relationships when used on a regular basis. This is because open bid formats involves the revelation of pricing information to competition, which erodes the supplier's bargaining power. Open bid formats also place a more explicit focus on price, a short-term variable that is usually the focus of transaction-oriented exchanges, instead of relational exchanges. When buyers use an open bid format, against a context in which relational exchanges are emphasized, it sends an inconsistent message to suppliers and may foster distrust.

Consistent with this line of thinking, my early research efforts in the automotive industry have shown that suppliers believe that buyers use open bid auctions opportunistically to gain additional price concessions, even when buyers are not using them opportunistically (Jap 2001). Interestingly, there is a significant gap between supplier *perceptions* of how buyers are using these auctions and the buyers' *actual* use of the auction. For example, post-auction interviews with suppliers who participated in an open bid auction indicate that they believed:

- the buyer uses an auction to survey market prices, with no intention of awarding the business to a winning supplier,
- the competing suppliers in the auction event are non-viable and unable to take the business away from the incumbent supplier, and that
- the buyer is "shilling" the bids, or posing as a competing supplier to artificially inflate the bids.

However, as an independent observer in all of these events, I knew for a fact that the buyer had every intention (and subsequently did) award the business to a winning supplier, that all

suppliers invited to bid were prequalified and able to take the business, and that the buyer did not pose as a supplier and bid against them. Moreover, I observed the buyer and auctioneer clearly communicating these aspects to the suppliers on numerous occasions. Despite their best efforts, suppliers refused to believe them. This gap holds significant implications, because a supplier's perceptions constitute its reality. These perceptions determine the supplier's actions and subsequent responses to ongoing circumstances. If the perceptions are negative, as when suppliers believe that the buyer is using the auctions opportunistically, then this could have a detrimental effect on supplier performance.

In the years since these results were documented, suppliers in the automotive industry have begun to organize themselves against the use of online, reverse auctions (*Automotive News*, 3/11/02). Specifically, these suppliers claim that the number of online, reverse auctions have far outnumbered the actual contracts that are awarded, evidencing the fact that buyers are abusing the auctions to see how low suppliers are willing to bid, and using this information to wring additional price concessions from incumbents. The suppliers are calling for the creation of a formal code of conduct to discourage such opportunistic behavior. This illustrates how the *mere perception* of opportunism in online, reverse auctions can have a detrimental impact on the buyer's efforts to develop long lasting relationships with suppliers.

Work is also needed on understanding the impact of a buyer's past relationship with a supplier on auction outcomes. For example, an interesting issue is how the relationship impacts the supplier's bidding strategy. Does a long-term, relational history with the buyer cause a supplier to provide higher or lower bids on average than suppliers without such histories? Perhaps the supplier bids are less competitive because it knows that it has numerous intangible aspects and implicit learnings that enable it to create higher value relative to its competition. Or perhaps the histories create an incentive for them to bid aggressively, because they have much to retain. A related issue

is how the history with the buyer affects supplier willingness to participate in online, reverse auctions. Clearly, new suppliers would embrace the opportunity to potentially gain new business through the auctions. But are suppliers with a long history with the buyer as motivated? Online, reverse auctions may motivate these suppliers to improve their performance, in order to assure their long-run presence in the supply base; alternatively, they may also alienate these suppliers by not acknowledging, or valuing, the intangible value (e.g., buyer-specific knowledge and processes) that these suppliers possess.

SUPPLY BASE CHARACTERISTICS

When deciding to host an auction, there are two characteristics of the supply base that are important to consider: spare capacity and the level and nature of competition. Let us consider each one in turn.

Capacity. If there is spare capacity in the supply base, then online, reverse auctions may be an efficient means by which suppliers can efficiently allocate this valuable resource. When spare capacity exists, suppliers can bid aggressively. The survey results indicate that buyers do hold auctions when there is capacity in the supply base; specifically, when asked whether suppliers' existing capacity had been freed up, the average response is 4.8 (sd=2.0, min 1 max 7) on a scale where 1=strongly disagree; 7=strongly agree. While this is not particularly high, the real issue is not the absolute level, but whether increasing capacity levels is associated with key performance outcomes in a positive manner. There is some evidence of this. Specifically, a correlational analysis indicates that as capacity in the supply base increases, buyers are more satisfied with the subsequent performance of the winning supplier ($r=.51$, $p<.04$), and tend to evaluate this supplier more positively ($r=.42$, $p<.09$). Also, expectations of continued use of the winning supplier increases ($r=.66$, $p<0$). Collectively, this suggests that when capacity exists in the supply base,

online, reverse auctions can be a useful means by which to set price and obtain satisfactory supplier performance.

Competition. Competition among suppliers is the bedrock of successful, reverse auctions. When competition exists, reverse auctions can add a lot of value to the sourcing process because they provide a format that incents suppliers to offer their best prices. Research in the theoretical literature on forward auctions indicates that as the number of bidders in an auction increases, so do bid prices and the rate at which the bids are made (Battalio, Kogut and Meyer 1990; Cox, Smith and Walker 1988; Dyer, Kagel and Levin 1989). Hence, more suppliers should lead to better price competition in online, auctions.

The survey results point to an interesting trend in regard to competition in the supply base. A correlational analysis indicates that when there is competition due to new international entrants in the supply base, the use of an online auction is positively associated with an improvement in the sourcing process ($r=.45$, $p<.03$). Additionally, there is a positive association with the buyer's evaluation of the auction tool ($r=.42$, $p<.04$) and expectations of continued use of the tool ($4=.35$, $p<.09$). It is surprising that competition due to new international suppliers is *negatively* associated with the buyer's evaluations of the winning supplier's performance ($r= -.79$, $p<0$) and the buyer's expectations of continued use of the supplier in the future ($r= -.43$, $p<.10$). Collectively, this suggests that while auctions may be an efficient mechanism for setting price when competition from new international entrants exists, the subsequent performance of the winners of these events is unsatisfactory. It is not known for certain whether buyers chose the new international entrant as the winning supplier. Consequently, the result could suggest either that buyers have negative experiences from using new international suppliers or domestic suppliers from these events. Perhaps the new international supplier is not able to perform to the buyer's expectations. Another possible explanation is that the domestic supplier who ultimately won the business, may feel pricing

pressure from the new international entrants such that it has an adverse effect on its performance. Perhaps the supplier feels that it has to shirk on quality in order to meet the necessary cost levels, or perhaps it retaliates against the buyer by removing value added services or key intangibles (e.g., delivery reliability, product support, salesrep responsiveness, etc.) that make the transaction more burdensome from the buyer's perspective. These explanations are purely speculative, but underscores some interesting possibilities to be explored in future research.

STRUCTURING ONLINE, REVERSE AUCTIONS

When it comes to structuring the online auction, there are several factors to consider:

- What auction format should be used?
- How large should the auction be?
- Which suppliers should be invited?
- What is the role of communication, training, and support?

In each of these areas, buyers face an array of possibilities as well as tradeoffs. All must be strategically managed to produce the best possible outcomes from the auction.

AUCTION FORMAT

Once a buyer has decided to host an online, reverse auction, it must then make decisions regarding the type of auction to run, or in other words, the level of price visibility to participants in the auction, as well as determining what the reserve prices, closing rules, and award rules will be in the event. Each of these aspects may have varying effects on key financial and relational outcomes for the buyer.

Price visibility. The options for price visibility are far ranging; for example, at one end of the spectrum are sealed bid formats. Here, buyers can choose whether to do a single or multiple round of bidding. They might also vary whether the supplier is informed that there will be single or multiple rounds of bidding before the first bid is placed. In the middle of the spectrum, there are many variations. One example is "low bid visible," which means that the suppliers only see the lowest bid at any point in time and will not see price concessions made above the lowest bid.

Another example is "pay to play," in which suppliers are not allowed to see any bids without submitting a bid first. Other auctioneers use a rank order format, in which suppliers are only told if their bid is the lowest, second lowest, or third lowest, but are not told the exact amount of the competitive bids or the range between their bid and other bids. To date, there is no systematic evidence regarding the effects of these variations in format on cost savings or subsequent supplier performance. However, this is a critical issue for future research.

In the exploratory data set, I consider whether the subsequent performance of the winning/losing suppliers of price visible formats (including full visibility as well as partial visibility) differ from those in sealed bid formats. Specifically, buyers were asked, "to what extent have the winning suppliers of these auctions changed their willingness to do the following since the auction?" Below each question was a list of behaviors such as uphold commitment dates, respond to product delivery problems and buyer requests, give you preferred access, be flexible in how you work with them, not mind owing each other favors, improve their product and/or service quality, servicing of your needs, etc. The scale anchors were 1=much less willing, 7=much more willing. The same question was asked of the losing suppliers. Since the majority of suppliers invited to auctions already exist in the buyer's supply base, the suppliers who did not win the auction may still continue to provide other parts or services to the buyer. I also examine the possibility that these suppliers might change how they work with the buyer as a result of the online, auction experience. There are no differences in this scale across price visible and sealed bid events for suppliers who won the auction event. Their mean responses are 5.20 and 5.44 across open and sealed events, respectively. However, there is a marginally significant difference ($F_{1,14}$=3.47, p<.08) in this scale across auction formats for the losing suppliers. In sealed bid auctions, the average response is 5.74, while the average response is 4.72 in the open bid auctions.

A similar pattern emerges in regard to the buyers' satisfaction with suppliers across open and sealed-bid auctions. There is no significant difference among buyers' satisfaction with the performance of winning suppliers across open and sealed-bid auctions; the mean responses are 5.0 and 5.7, respectively. However, the buyers report higher satisfaction with the performance of losing suppliers who participate in sealed auctions (6.0) than those who participate in open auctions (4.1). The difference is significant ($F_{1,11}=4.72$, $p<.05$). Collectively, these results suggest that over time, there is an observable performance and support difference among suppliers who do not win auction events; specifically, those suppliers who participate in price visible auctions and lost tend to perform significantly worse and are less supportive of the buyer over time than the losing suppliers of sealed bid auctions.

Setting the reserve price. A final issue to consider is the role of the buyer's stated reserve price in online, reverse auctions. Typically, this price incorporates the buyer's switching costs from an incumbent to a new supplier. However, the reserve price can also serve as a strategic signaling variable or a means by which to influence supplier bid strategies (cf., Häubl and Popkowski Leszczyc 2001). For example, if the buyer's reserve price is relatively high, it may encourage bidders to aggressively drive the price down. Alternatively, it may act as an anchor, such that suppliers also keep their bids high. Recent research in online, consumer auctions indicates that the latter tends to be true. Specifically, in a forward auction, a low, initial price set by the seller would draw more bidders to the auction (an indicator of interest), but unless the larger number of bidders *triggers* an aggressive bidding war, the anchoring effect of the low price will prevail (Ariely and Simonson 2002). This is an intriguing result that has yet to be verified in industrial settings.

Closing the event. How to close the event is another issue to consider. Most industrial buyers favor a soft close over a hard close because they want to give suppliers every opportunity to respond. However, there is no systematic evidence on which generates superior financial

performance. Research in online auctions of consumer goods indicates significant differences in bidder behavior associated as a result of deadline effects (cf., Bajari and Hortaçsu 2000; Wilcox 2000). Specifically, researchers have found that in hard-close auctions, bids are much more concentrated near the end of the event; this has been shown in both field settings (Roth and Ockenfels 2001) and laboratory experiments (Ariely, Ockenfels and Roth 2001). In industrial settings, research is needed to determine what type of ending would produce greater cost savings and how these endings incent and impact supplier bidding behavior.

Awarding the event. Many of the online, reverse auctions used in industrial sourcing activities today involve buyer-determined, as opposed to event-determined, awards. How does this difference impact supplier attitude toward the process? I would argue that suppliers would find buyer-determined awards to be a more opportunistic approach than event-determined awards. This is because with an event-determined award rule, the suppliers can clearly map their effort to their outcomes, whereas with a buyer-determined award rule, the determination process is more ambiguous. It was noted earlier that buyer-determined award rules make the bidding process increasingly difficult for suppliers, as they do not have a clear picture of where they stand relative to the competition. On the other hand, one could argue that buyer-determined award rules is the typical practice in sourcing negotiations, not full-visibility event-determined negotiation processes, so buyer-determined award rules should not have any detrimental effects on supplier attitudes and reactions toward the event, since that is the supplier's reference point. Determining which effect will prevail in organizational contexts remains an open question, and a critical direction for future research.

THE SIZE OF THE AUCTION

The size of the auction, in terms of how many products to auction, the number of suppliers to invite and the number of lots to configure is a critical aspect of structuring an online, reverse

auction. The effectiveness of each may vary in a curvilinear manner; for example, too few products in an event may not motivate suppliers to participate, whereas too many may be overwhelming for suppliers to determine an optimal bid strategy. Instead, some intermediate number may be a more optimal approach. As the buyer considers how to make the total value of the contract large enough to incent suppliers to bid competitively and aggressively against each other, this raises a number of issues such as, what is "large enough?" Could a bidding event ever be too "large?" Some buyers only make large purchases periodically. Does this mean that auctions could not be useful for the purchase of individual items or lower contract volumes? I offer my own perspectives on this issue.

To begin with, it is true that the purchase contract must be large enough to incent a supplier to bid. However, this does not mean that auctions must be restricted to large volume purchases only. A number of auctioneers have developed auction software for the procurement of smaller volume purchases. For example, if a buyer needs to procure a plastic tube as a spot purchase, there are auction formats and software available that will facilitate the rapid solicitation of bids from a number of suppliers.

Another aspect to consider is not the size of the total purchase contract, but the lotting strategy – the size and number of each lot – for a particular auction. One firm who participated in this research indicates that it spends a significant amount of time discussing this issue when training their buyers to use these auctions, despite the fact that it is something that the firm knows the littlest about. The lotting strategy may comprise several aspects. One issue is whether a mega lot (a "winner-take-all"), which constitutes a bid for the entire RFP, should be offered. This only makes sense if some of the competing suppliers have the capability to supply the entire RFP. There also exists a tradeoff between increasing the value of the lots (the "leverage" of the event) and the number of suppliers who can bid on those lots: suppliers who are incapable of offering all the items in a lot are precluded from bidding on it. On the other hand, if there are too many lots, suppliers

may "learn" across lots; that is, they may learn which competitors have aggressive pricing strategies or may deduce whom the competitors are based on their ability to bid on lots of varying size and capability requirements.

Moreover, as the number of lots in an event increases, interdependence among lots and ambiguity regarding winner selection makes it difficult for suppliers to accurately gauge their standing and make subsequent bids on lots. This creates inefficiency with the auction mechanism, which may have an adverse effect on the bidding process. The survey data are supportive of this notion; specifically, a correlational analysis indicates that as the number of lots in an auction event increased, buyers are less satisfied ($r = -.33$, $p < .10$) with the auction tool and tend to evaluate it more negatively ($r = -.39$, $p < .05$). Thus, buyers should be wary of creating too many lots per auction event.

SUPPLIER SELECTION

Determining which suppliers to invite to the auction is a non-trivial task, as the outcomes of the bidding process is a direct function of this decision. Only suppliers who have been prequalified and are capable of satisfactorily fulfilling the purchase contract should be selected. If not, the buyer risks generating meaningless bids and the possibility that non-qualified suppliers place undue price pressure on the qualified suppliers. This is unfair to those suppliers who are capable of providing the business and attempting to bid sincerely for the business; if these suppliers discover that non-competitive suppliers are artificially defeating the price in this way, the suppliers might opt out of bidding in the future. In fact, there is evidence in the experimental economics literature that suggests that as bidders earn lower than average profit margins, the bidders "learn" over time and will begin to self-select out of future auctions or respond by bidding less (Garvin and Kagel 1994). The same could occur in industrial settings. There needs to be integrity in the process if auctions are to remain a permanent fixture of the sourcing landscape.

Prequalification of suppliers may range from a survey of their capabilities to use of internal or external databases or consultants, or even on-site visits and plant tours. The survey data indicates that buyers invited on average, 9.6 (sd 9.3, min 3 max 46) prequalified suppliers to their auction events. These buyers also engage in a variety of prequalification activities; below are the proportion of respondents who utilize each of the following:

Capabilities survey	77%
Personal calls/query	75%
In-house database	53%
Outside research	47%
Site visits	29%

Like lots, there may be an optimal number of suppliers who should be invited to an auction event. On one hand, too few suppliers create too little competition, but too many suppliers may also be problematic. If suppliers feel that the competition is too high, they may be discouraged from bidding, in which case, the overall cost savings could be adversely affected. Consistent with this, the data indicates that as the number of suppliers invited to an auction increases, there is a negative association with the buyer's satisfaction with the auction tool ($r= -.42$, $p<.03$), expectations of continued use of the tool ($r= -.50$, $p<00$), and subsequent performance evaluations of the winning supplier ($r= -.57$, $p<00$).

COMMUNICATION, TRAINING AND SUPPORT

It is imperative that suppliers are adequately trained to use the auction software and informed of the event rules prior to the auction event. Full service auctioneers will typically provide training via one-on-one meetings, simulations, and technical support so that suppliers feel comfortable with the auction software and understand not only how to place and modify bids, but also how to deal with alternative contingencies that might arise during the course of the bidding event. Suppliers should also be encouraged to consider their costs, bottom line, and possible bidding strategies via what-if analyses and contingency planning. They may need this training to insure that they do not bid below their marginal costs. Since the bids in online auctions are legally

binding, suppliers could stand to lose a lot of money if they don't properly understand their cost structure or how to interact with the online software. Training is also important from the buyer's perspective, as it helps insure that the buyer receives accurate, high quality bids during the auction event.

The final critical aspect to running an online, reverse auction is to clearly communicate the rules of the auction and how the award decision will be made to the suppliers. In many industries, suppliers may have little to no experience with auctions. It is important for the buyer to specify whether the auction is being used to award a purchase contract or merely to procure information and determine market pricing. The rules of the auction should be clear – whether the format will be a sealed bid or full price visibility, a low-bid visible, or a rank-order format, whether the auction utilize a soft or hard close, what the minimum bid increment will be, and when the winners will be announced. Suppliers also need to know the basis on which awards will be made, whether it is on a first- or second-price basis or whether the buyer holds the final determination. Without this information, suppliers may have difficulty producing quality bids and the outcomes of the auction could be detrimentally affected.

While training, communication, and support are necessary to facilitate a smooth-running event, my observation has been that these aspects are not sufficient to avoid or minimize supplier perceptions that the buyer is using open bid auctions opportunistically. I have often witnessed buyers and auctioneers taking a "text book" approach to these issues; by this I mean that they strive to clearly communicate to the suppliers on several occasions the rules of the game, the buyer's intentions, and underscore the viability of the competition, as described above. They are thorough in their approach and are willing to do whatever is necessary to clearly communicate to suppliers. Yet suppliers remain skeptical. This indicates that running a successful auction event, from both a

buyer and supplier perspective, may not be a simple proposition; it may require an understanding of the process and its effects that runs deeper than mere communication and implementation strategies.

EVALUATING ONLINE, REVERSE AUCTIONS

The typical means of evaluating an online, reverse auction is to consider the cost savings from holding such an event. However, there is much more to consider beyond the prices that are set. There are other factors regarding the effectiveness of the tool, and its impact on the buying process. In addition to this, there are supplier performance issues in terms of both product and relationship quality. And of course, it is also important that the supplier receives some valuable outcomes if auctions are to remain a long-run sourcing practice. Let us consider each of these in turn.

FINANCIAL IMPACT

One of the chief concerns of any sourcing strategy is cost savings, or the percentage reduction in price from historical costs. This is a critical number, an important criterion that the firm uses in evaluating the performance of its buyers and their procurement effort. As such, cost savings are also a central aspect of evaluating the performance of online, reverse auctions. On this dimension, online, reverse auctions appear to perform quite well. This is why many organizations have concluded:

> Reverse auctioning and strategic sourcing provide the quickest paybacks among most (if not all) IT implementations. – David Scott Lewis, META group, (September 2001).

The instantaneous cost savings that they produce are a major impetus behind their success. And even the exploratory survey results indicate that the online, reverse auctions produce significant financial savings (18%), in fact, greater than expected (11%).

What type of online, reverse auctions yields the greatest cost savings? There is no systematic answer to date. The economics literature makes some suggestions, although they are based on auction phenomena observed under much more restrictive conditions than those used in

the marketplace. For example, in events where the rules of allocation are clear (e.g., the winner is determined on a first- or second-price basis), the literature indicates that if the bidders' have *common* values, the open bid auction format will produce greater cost savings than a sealed bid auction (Milgrom and Weber 1982). When bidders' values for the contract are common, it means that the value of the item is the same to all bidders, but bidders have different information about the underlying value. These characteristics of the bidders' valuations are similar to industrial sourcing auctions. There exists a true value for the contract – namely the worth of the contract in the market. However, no one knows this true value and each bidder has a different guess about how much the item is objectively worth. So one might expect that online, open bid auctions would yield significant savings over sealed bid auctions. However, this has yet to be verified in industrial settings.

PROCESS IMPACT

Along with the financial impact, buyers ought to evaluate not only the online, auction tool, but also how it impacts the total cost of ownership of a product. After an auction, buyers ought to consider whether the event met their expectations and whether the tool performed satisfactorily. Should the tool be used again in some capacity? Could it play a long-term role in the buyer's activities? These issues speak to the value of online, reverse auctions in the sourcing process. In the exploratory survey, the results indicate that buyers were fairly satisfied with the auction process and anticipated that the auctions could play a long-term role in their sourcing strategies. Specifically, the average response to a multi-item scale measuring the buyer's evaluation of the online auction tool is 5.0 (sd 1.5, min 1 max 7) where 1=strongly disagree and 7=strongly agree. The average response to another multi-item scale measuring the buyer's expectations that it will continue using online auctions on a long-term basis is 5.4 (sd 1.7, min 1 max 7). Collectively, these results indicate that buyers generally evaluated the use of online, reverse auctions favorably. In

fact, when asked, "would you use reverse auctions again?" Ninety-three percent of the respondents indicate Yes, and point to factors such as lower prices, global reach, negotiation efficiencies, competition and product comparability. Only 7% indicate No, and note that the auctions hinder relationship building, are too emotional, inflexible, and contain a paucity of information for suppliers.

Another important consideration is whether online, reverse auctions can impact the total cost of ownership of a product by enabling a more efficient buying process. Previously it was noted that online, reverse auctions reduce the negotiation process from 6 weeks to a few hours. What is the implication of this? Do buyers feel that the compression of this process has resulted in the removal of unnecessary work or constraints prior to or following the auction? Does the use of an auction have any effect on improving the transaction process, reporting process, or supporting logistics that typically surround the transaction?

In the exploratory survey, the buyers were asked to indicate their perceptions of whether the online auctions improved the sourcing process. Their responses are more tepid, relative to their reported satisfaction and intentions to continue using the online auctions. Specifically, on a multi-item scale measuring the extent to which the purchasing process has been improved, the buyers report an average response of 3.8 (sd 1.4, min 1 max 6.2) where 1=strongly disagree and 7=strongly agree. This is rather surprising, but may be indicative of several possibilities. It may be that auctions do not play a role in improving process efficiencies or it may simply indicate that buyers have not yet determined how these auctions can be translated into process efficiencies. Multiple experiences with a variety of firms indicate that buyers do not typically initiate the use of online, reverse auctions into their sourcing activities. Instead, the use of such auctions in many organizations is usually the result of an upper management edict. Providers demonstrate the ability of these auctions to capture rapid cost-savings to senior executives, who then require buyers to

incorporate and use the auctions in their activities. This may explain why it appears that buyers are not considering how online, reverse auctions might impact their buying process.

What is needed is more strategic thinking about when the online auctions ought to be used in sourcing activities and how these auctions interact with ongoing sourcing processes. This remains a huge area of potential research. Research that would identify how and if cost savings are generated from the process changes that occur when auctions are employed would be extremely valuable, and would inform our understanding of how auctions impact not just the buyer's ability to negotiate price, but the total cost of ownership for a product.

SUPPLIER PERFORMANCE

Along with consideration of the financial and process impact of the auction, firms ought also to evaluate the subsequent impact on supplier performance as a result of using online, reverse auctions. There is an array of possibilities. If the auction mechanism is efficient, then it should enable pricing equal to the supplier's marginal costs with no detrimental impact on product quality or relationships with the supply base. This might occur with the purchase of indirect goods. One would also hope that this process incents noncompetitive suppliers to become more competitive or drop out of the supply base permanently.

However, the auction outcomes may be inefficient, particularly if the product's value is not primarily price-based. For example, a potential inefficiency occurs if suppliers believe that buyers are using the auctions to opportunistically wring additional price concessions from them; these beliefs cannot exist in isolation over time without detrimentally affecting supplier actions and motivations. If suppliers begin to shirk on commitments, withhold useful information, become less responsive, or detrimentally alter the product quality as a response to their beliefs that the buyer is acting opportunistically, then the buyer may notice the changes in behavior, and might respond in kind in a tit-for-tat fashion (Axelrod 1984). In this manner, the buyer-supplier interaction process

can take a dysfunctional turn for the worse, ultimately eroding the financial and relational outcomes developed between the two firms.

I believe that supplier perceptions of buyer opportunism will have a detrimental impact on their subsequent performance and explore this possibility in the survey, but found equivocal results. Respondents were asked, "How has the performance of the *winning* suppliers changed over time?" Seven of 12 open-ended responses to this question are positive. Specifically, those who answer in the affirmative point to improved cost savings, performance, delivery, product excellence and buyer support. In these cases, the use of an online auction was an effective wake-up call to these suppliers. However, 5 respondents note that there has been an increased focus on price, the relationship has dwindled, and complications have arisen subsequent to the use of the auction. One respondent notes, "The nickel and diming has been high. We expected some hidden costs but at times it is difficult to work with new suppliers that won the business."

Respondents were also asked, "How has the performance of the *non-winning* suppliers changed over time?" Again, the results are equivocal. Five out of the 12 open-ended responses are positive, indicating that these suppliers now appear to be working harder, are more cost competitive, and "more scared than angry." However, the remaining seven responses are negative. Buyers point to increased anxiety and provision of information. In some cases, suppliers became more adamant about holding buyers to their promises: "They expect either an increase in volume (pre event) or market share and hold you to it," said one buyer. Others note that the changes are subtler. For example, one buyer comments that there had been, "No appreciable change, except for sense that our relationship is now more of a pure business venture and that both parties need to look after their own interests. We detect that suppliers sense that the ongoing relationship is increasingly superficial." Perhaps future research, working with a greater sample size or a longer time frame can provide better insights into this critical issue.

Another possibility may be that it is how the buyer managers supplier relationships *post-auction* that has a greater effect on long-term supplier performance than any one specific auction event. For example, if the buyer works with the suppliers in a collaborative manner to decrease the total cost of ownership, insure responsiveness to demand, improve process excellence, and leverage existing technologies, this may have a much greater impact on long-term supplier performance, attitudes, and strategic position vis-à-vis the buyer than any single, online, auction held at the start of the process. And in fact, many firms have supplier management programs in place that emphasize these aspects in their relationships with suppliers. Such an approach would certainly mitigate the negative effect of auctions in the long-term.

SUPPLIER OUTCOMES

The long-term success of online, reverse auctions cannot rest on the buyer's outcomes alone, but on the outcomes for *both* parties. Hence, it is important to consider the financial and process impact on suppliers as well as buyers. While buyers are concerned with cost savings, suppliers are concerned with revenue maximization. This can come in two forms – from new customers or from growing sales and benefits with existing customers. Online, reverse auctions can be a means by which suppliers can grow their revenue and customer base, as these auctions can enable heightened access to new markets and customers. To the extent that auctions can introduce suppliers to buyers and these relationships can be successfully cultivated over time, online auctions can be a useful and efficient mechanism for suppliers.

Can online, reverse auctions grow sales with existing customers? At first blush, it would seem that online, auctions are antithetical to the process of building successful, long-term relationships with suppliers. However, this should not preclude buyers from using online, reverse auctions at least occasionally in their supply base. Online, reverse auctions can be used on a limited basis with an existing supply base, but it is recommended that they be used as a screening

mechanism to long-term arrangements as opposed to ongoing price negotiations. The reason for this is because online, reverse auctions can be an effective wake-up call to a complacent supply base (Jap 2001). Specifically, as a result of only one auction experience, suppliers will become more willing to work closely with a buyer; incumbent suppliers become more determined than ever to remain in the buyer's supply base, and both new and incumbent suppliers are willing to make the dedicated investments necessary to achieve this. This has important implications, as these types of attitudes facilitate long-term sourcing arrangements that can add tremendous value for buyers. It also suggests that online, reverse auctions may serve a screening function by which buyers can insure price competitiveness and suppliers can gain assurances of stable revenue growth into the future.

Another issue to consider is how the use of online, reverse auctions impacts the negotiation process from the seller's point of view. Interviews with suppliers indicate that they feel extremely vulnerable in full price visibility auctions; they are concerned that they may sacrifice valuable margins in a moment of competitive irrationality and there is tremendous pressure because they know that their bids are legally binding. They fear "losing control" in an online, auction event and are concerned that the visibility of their prices to competitors erodes their bargaining power. Suppliers have often told us that the computer-mediated format of online auctions is particularly constraining. It impedes their ability to inform the buyer of their non-price, value-added attributes and "commoditizes" their products by reducing them to one attribute, namely price.

A final concern is the supplier's beliefs about the buyer's performance in the relationship. If they believe that the use of online, reverse auctions signals a movement toward market-oriented, arms-length relations, then suppliers will act accordingly. As suppliers believe that buyers are increasingly short-term oriented and concerned about their own gains, then they too may respond in kind. However, if the buyer signals that the online, reverse auctions are a rare occurrence, used as

a stepping-stone to a long-term, mutually beneficial financial arrangement, then suppliers will be more motivated to become mutually oriented and may respond more competitively, in light of the long-term gains.

CONCLUDING REMARKS

In the preceding sections, I have tried to give the reader a sense of the online, reverse auction landscape, by raising a variety of issues in regard to when, how, and why the auctions are used in industrial sourcing activities. The goal has been to illuminate the need for problem-oriented research in this area and to encourage others to explore this emerging aspect of the online, B2B landscape. In Table 1, the foregoing ideas are summarized and further developed into an agenda for future research.

A call has been made for a long-term consideration of how online, reverse auctions might affect the supply base and sourcing practices, in general. The first thing to remember is that the cost savings from these auctions ought to diminish over time. Each subsequent auction is unlikely to yield the same levels of price savings as the one prior. As prices drop, it may become increasingly difficult for suppliers to sustain the new price levels. Non-competitive suppliers will exit, but if the prices drop too low, viable suppliers may be forced to consolidate with the competition in order to reach the cost curves necessary to support the new price levels. Consolidation decreases the viable alternatives in the supply base and may increase the bargaining power of suppliers; both are adverse conditions for the buyer. Hence, it is important that online, reverse auctions are used thoughtfully, as a strategic decision of the firm and it is imperative that we have a better understanding of when, how, and why they should be used.

How will online, reverse auctions impact sourcing practices in the long run? For now, the tremendous interest and growth in these auctions has been due to their ability to provide immediate, cost-savings in the short-run. But as these savings diminish over time, will buyers continue to use

online, reverse auctions or will they disappear from the sourcing landscape? A bold conjecture would be that such auctions would ultimately disappear, once costs have been squeezed from the sourcing process. Suppliers will be demotivated, cost structures will not be sustainable, and the relational impact will be so adverse that buyers ultimately abandon the online, auction tools. Or is it the case that online, reverse auctions are here to stay regardless of the cost squeeze and will continue to provide sourcing efficiencies in terms of process efficiencies, rapid introduction of new suppliers, etc. My own prediction is that online, reverse auctions will remain in the supply base in the long run. They offer tremendous process efficiencies and enable buyers to rapidly organize a wide array of suppliers for a competitive bidding event. Besides delivering cost savings, they can also be used as an important screening device for long-term relationships. However, there needs to be clarification of the conditions under which the auctions should be used, the effects of one format over the other and a more holistic evaluation of the auction results in both the short- and long-term. These issues should be the fodder of future research in this area.

A final critical question in regard to the cost-savings generated from online, reverse auctions is where is this money coming from? Are these auctions merely masking inefficiencies in the configuration of the supply chain or poor sourcing practices? For example, if buyers were to improve the logistics, delivery, and warehousing patterns of their current products, would they achieve similar results? If buyers were better at market analysis or worked more closely with their suppliers on an ongoing basis would they achieve comparable results? If this were so, it would mean that the cost savings that currently generated through these auctions are overstated and better sourcing practices would be a more productive long-run solution than the occasional jolt that online auctions create in the supply base.

There remains a pressing need to understand better how emerging technologies and the phenomenon that they facilitate will operate and be utilized across organizational contexts. By

studying the interface between online, reverse auction phenomena and organizational contexts, deep insights can be generated into the conditions under which such auctions should be used, the means by which the auctions should be structured, and the many ways in which auctions should be evaluated or considered as a strategic decision variable of the firm. These auctions represent a major development in the sourcing and procurement of industrial products, which we cannot fail to ignore. They are creating new challenges for managers in all organizations. How the firm should appropriate and exploit the use of these auctions in its sourcing activities involves an understanding of the organizational context, not technology. It is the ability to recognize the advantages and disadvantages of the online, reverse auction format and utilize these aspects across a variety of settings that is the critical skill.

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FIGURE 1
OVERVIEW OF THE DISCUSSION

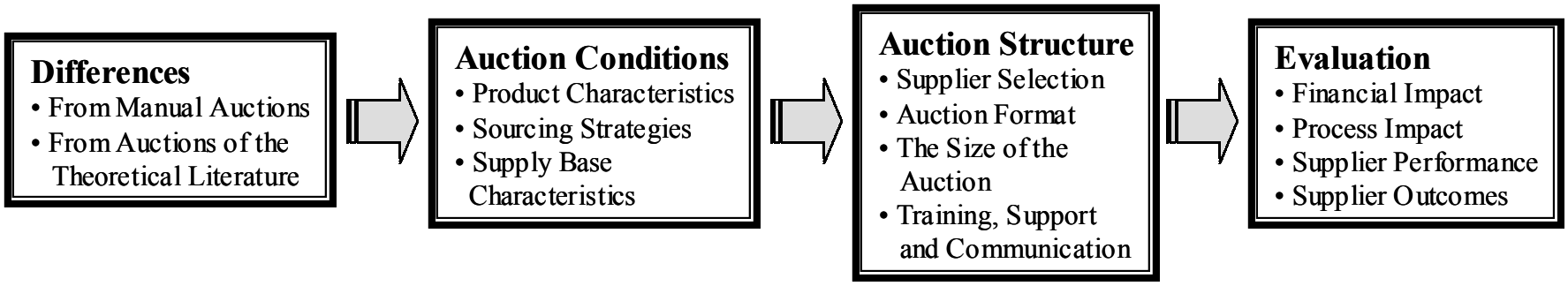

FIGURE 2
THE OPEN BID AUCTION FORMAT

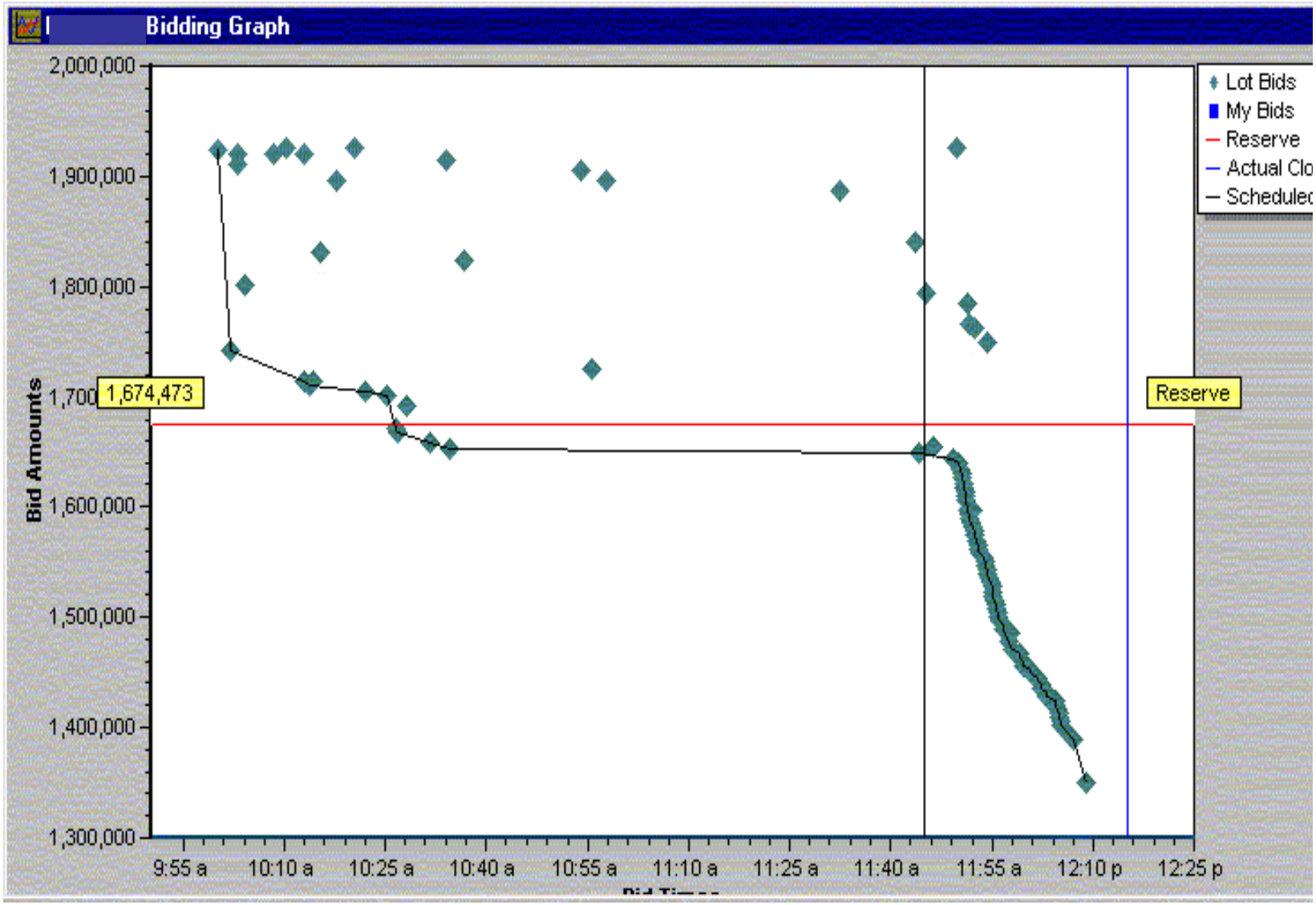

TABLE 1
AN AGENDA FOR FUTURE RESEARCH

Conditions for Using Online, Reverse Auctions
Can auctions be structured for more complex, strategic products? Can services be successfully auctioned and are there specific considerations for this product class?
Are multi-attribute auctions effective in enabling suppliers to express non-price value?
How do multi-attribute auctions impact financial, relational, and process outcomes for buyers and suppliers?
Do auctions enable buyers to lower the total cost of ownership above and beyond ongoing sourcing strategies?
Can auctions be successfully used with ongoing relationship development strategies?
How to manage the perceptual gap between supplier suspicions of opportunism and the actual level of opportunism on the buyer's part?
How does the buyer's past history with a supplier impact the supplier's motivation and bids?
Are auctions efficient mechanisms for allocating spare capacity in the supply base?
How does varying types of competition impact the achievement of key financial, process, and relational outcomes?
Structuring Online, Reverse Auctions
How does price visibility impact cost savings or supplier performance?
How do the conditions, structure, and outcomes of online, reverse auctions change when there are multiple buyers?
How does a hard- or soft-close impact the bidding strategies of suppliers? How do the closing rules psychologically impact suppliers? Are there subsequent attitudes toward buyers dis/favorably altered?
How does the buyer's stated reserve price impact suppliers' bidding strategies?
How does the buyer's reserve price impact the supplier's bid size?
Which close rule (hard-soft) yields greater savings?
What is the optimal number of supplier or lots in an online, reverse auction?
How does suppliers' bidding strategies differ across a range of auction formats? (e.g., full, partial, or sealed price visibility)?
Evaluation of Online, Reverse Auctions
What is the long-term impact of online, reverse auctions on supplier performance?
How do auctions impact the total cost of ownership of a product?
In the long-term, will suppliers improve their performance and become more cost competitive or retaliate, shirk, and become increasingly opportunistic?
To what extent can supplier management programs, post-auction, mitigate the negative effects of these auctions on supplier attitudes and performance?
Can auctions be successfully used as a screening mechanism to a long-term sourcing arrangement?
How to create more process value for suppliers?
Will auctions remain in the supply base or are they a fleeting trend?
How will auctions ultimately impact sourcing practices?
Where is the cost savings being generated? Are they overstated?

APPENDIX 1
MULTI-ITEM MEASURES

For the following items, 1=strongly disagree and 7=strongly agree α = Cronbach's alpha

Satisfaction with the Auction Tool (α=.95) Adapted from Ruekert and Churchill (1984)
Our use of an electronic auction has been a successful aspect of our sourcing strategy.
Overall, the value of the electronic auction approach in our sourcing strategy has fallen short of our expectations (R)
Our experience with the electronic auction has more than fulfilled our expectations.
We are satisfied with the role of the electronic auction in our sourcing strategy.
Our experience with the electronic strategy has been a successful one.

Improvements in the Exchange Process (α=.84)
Unnecessary work (waste) has been removed from suppliers' processes.
Some of our constraints (e.g., quality, lead time, contract length, quantity) have been removed from the supply process.
The transaction processes between the supply base and us have been improved.
The logistics supporting our transactions with the supply base have improved.
The reporting of data in our transactions with the supply base has improved.

Evaluations of the Auction Tool (α=.68) Adapted from Kumar, Stern and Achrol (1992)
The electronic auction approach leaves a lot to be desired from a strategic perspective. (R)
If I had to rate the electronic auction's value to our sourcing strategy, it would be outstanding.

Expectations of Continued Use of the Electronic Auction Tool (α=.89)
We expect to continue working with the electronic auction tool approach on a long-term basis in our sourcing strategy.
The electronic auction approach will play a long-term role in our sourcing strategy.

For the following measures, respondents were directed to complete each item with respect to either the winning supplier or non-winning suppliers. Hence, "them" refers to either the winning or non-winning supplier.

Satisfaction with the Winning/Non-Winning Suppliers (α=.94/α=.89) Adapted from Ruekert and Churchill (1984)
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 Continued Use of the Winning/Non-Winning Suppliers (α=.99/α=.89)
We expect to continue working with them on a long-term basis.
Our relationship with them will last far into the future.

Changes in Behavior of Winning/Non-Winning Suppliers (α=.97/α=.94)

To what extent have the winning/non-winning suppliers changed their willingness to do the following since the E-Bid?

Uphold commitment dates
Respond to product delivery problems
Provide a quick turnaround on failure analysis
Respond to buyer requests
Be available to your personnel
Give you preferred access in times of high demand
Give you first access to innovations
Spend a higher amount of time and effort with you relative to other customers
Be flexible in how you work with them
Be committed to improvements that may benefit the relationship as a whole, and not only the individual firms
Not mind owing each other favors
Improve their service quality
Improve the quality of their components
Improve their servicing of your needs

APPENDIX 2
PRODUCT LISTING

Products Purchased through Online, Reverse Auctions

cables*	electrical components*	MRO supplies
computer parts*	fabricated components	piping
computer parts*	fuel	plastic parts*
construction services	handbook*	power*
copy paper	hotel services	pumps
cylinders*	labels	sheets
disposal services	material compounds	software*
drives*	meeting services*	switches*
drums*	metal parts*	systems

* indicates products for which more than 90% of the total cost of ownership is accounted for by the purchase price alone.

ENDNOTES

[1] For a more detailed perspective on how buyers plan and implement an auction in the marketplace, the reader is referred to Emiliani (2000).

[2] Office equipment, and maintenance, repair and operating supplies are some examples of this.

[3] There are hosts of consulting firms that currently aid buyers with this process.