Operating Strategies
by Tim Laseter
and David Evans

Beating the B2B Odds

Internet auctions create losers as well as winners. Game theory shows companies how to improve their chances.

In 1995, FreeMarkets Inc. introduced the business world to a new Internet phenomenon: the online auction. The results — cost savings of up to 39 percent for a variety of custom and commodity products, in many industries — attracted the attention of corporations under the gun to reduce costs. Now, billions of dollars in sales later, the online auction has become a powerful weapon in the arsenal of purchasing professionals. Since it requires only about $30,000 in software, it has also become a standard component of the hundreds of business-to-business exchanges currently under development.

Are the savings real? Are they sustainable? Fifty years of research in game theory suggests that B2B auctions will certainly drive real savings — but not always for good reasons. Over time, auctions may winnow the field of suppliers, leaving the cleverest survivors in a stronger negotiating position with their customers. These previously downtrodden suppliers will surely seek penance from their erstwhile overlords.

Webster's Dictionary defines an auction as "a sale of property to the highest bidder," a familiar system known as an English auction. Common on eBay and at fine art houses and livestock shows, English auctions favor the seller of rare or otherwise valuable merchandise. But English auctions have only limited application in B2B transactions, where buyers have the clout. Most online B2B auctions operate under Dutch auction rules, with bids reduced each round until the *lowest* bidder wins.

Auctions can also employ more complicated rules than those that simply award the prize to the most aggressive bidder at the price offered. Some auctions employ a Second Price, Sealed Bid approach. Under this model the highest (or lowest) bidder wins, but pays the price of the second highest bidder. In theory, this model pushes bidders to more aggressive levels, since they know that if they win, they pay less than the bid amount.

Prisoner's Dilemma

Though auctions date back thousands of years, game theory has a modern origin. A specialty in the field of economics, it grew from seeds planted by the 1944 book *Theory of Games and Economic Behavior*, by

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John von Neumann and Oskar Morgenstern. They examined individual decision-making in competitive situations between two or more "players." The theory assumed "rational" behavior by each participant, who would ultimately develop strategies based upon an examination of what the other party or parties were likely to do. During the Cold War, game theory found considerable application as strategists assessed possible responses by the U.S. and Soviet Union to strategic moves, threats, and promises. Today game theory remains a common tool in politics, the social sciences, and economics, used in such situations as exploring the impact of different tariff policies in international trade.

Games consist of three elements: players, payoffs, and strategies. The Prisoner's Dilemma offers the simplest and most common example. In this game, two crime suspects face separate interrogations about a burglary they have, in fact, committed together. To encourage confessions, the police offer potential immunity to each suspect if he testifies against the other. If neither suspect confesses, each will receive a one-year sentence for the relatively minor offense of possession of stolen property. If both confess, each will receive a five-year sentence for burglary. If one confesses and the other does not, the confessor goes free while the one maintaining his innocence gets a 10-year sentence.

To simplify the explanation of such games, game theorists use a payoff matrix. (See Exhibit 1.) The row headings of the matrix list the strategies available to the first player, or suspect, while the column headings list the second player's potential strategies. Each cell lists the payoff to each player — by tradition listing Player One's payoff first.

A quick look at the matrix highlights the difficulties faced by the two suspects, who are separated and unable to communicate. Declaring their innocence yields the best combination for the two players. But the opportunity to get off free by confessing poses a temptation to each suspect, while a decision not to confess poses a big risk. What should the players do?

Exhibit 1: **Prisoner's Dilemma**

Note: Cell values indicate sentence for Suspect One and then Suspect Two under each scenario.

John F. Nash Jr. won a Nobel Prize in 1994 for his 1950s doctoral research that examined each player's strategic options and identified the "logical" conclusion of games like the Prisoner's Dilemma. To understand Dr. Nash's model, consider a decision by Suspect One not to confess. If Suspect Two also doesn't confess, then the game results in a one-year sentence for both players, as indicated in the bottom-right cell. But Suspect One must consider the option of switching his strategy, for if Suspect Two indeed does not confess, Suspect One has the potential to do even better by confessing — shifting from the bottom-right to the top-right cell — and getting off free.

On the other hand, if Suspect One declares innocence but Suspect Two confesses, the payoff falls into the bottom-left cell. Once again, Suspect One must consider the opposite strategy — confessing and shifting to the top-left cell. Such a move improves the payoff for Suspect One — a five-year sentence instead of a

10-year one. In other words, under either option taken by Suspect Two, Suspect One does better by confessing. In this example, game theorists describe confession as a "dominant strategy," since it always yields a better outcome than not confessing.

Unfortunately, the dominant strategy logic applies for Suspect Two as well. Nash argued that the point at which neither player can improve his payoff by changing his decision presents a logical equilibrium and the rational result for such a game. In this case, the top-left cell signifies this rational outcome — now known as the Nash Equilibrium.

Nash Exceptions

The Nash Equilibrium provides the justification for aggressive competitive bidding in B2B auctions. Although two suppliers bidding for the same business could, like the burglary suspects, theoretically cooperate and set high prices, the option to undercut the competitor's last bid always proves dominant to losing the auction — until the point where the price equals the marginal cost of production.

Unfortunately, in real life and in games, the logic of the Nash Equilibrium does not always play out. Over the years, game theorists developed further theories to explain observed behaviors that did not match the basic theory.

Take the "Winner's Curse" — the observation that, as the number of auction bidders increases, the more likely it is that the winner will have overestimated the item's true value. First discussed by E.C. Capen, R.V. Clapp, and W.M. Campbell of the Atlantic Richfield Co. in their 1971 *Journal of Petroleum Technology* article "Competitive Bidding in High-Risk Situations," the theory set out to explain behavior in oil lease sales. Despite the successful extraction of oil and gas in the Gulf of Mexico, investors received low returns on investment in the region.

The researchers discovered that because of the inherent uncertainty in oil exploration, projections for an individual field differed by a factor of 10. Individual bidders logically adjusted bids to reflect their own expectations, assuming that, over time, any errors would average out, with the high estimates canceling the low estimates. In a competitive bidding situation, however, the law of averages does not apply. Bidders who underestimate the value of the property lose the auction and the one who overestimates the value the most ends up the winner — albeit a winner who has overpaid.

Based on these observations, the authors concluded that for auctions with many bidders, the wise bidder will bid less aggressively. Such advice contradicts conventional logic, which says more bidders would suggest more aggressive bidding. In fact, bidding higher would be an appropriate tactic if one's only goal were to possess the object in question. However, if one's purpose is to earn an attractive rate of return, then conservative bidding should be the rule.

The objective of suppliers competing in business-to-business Dutch auctions should be to win business that offers a good profit margin, not simply to win business to produce revenues. So suppliers participating in online auctions — particularly those bidding to supply a newly engineered product with uncertain specifications — should beware the Winner's Curse. Bidding too aggressively may drive them out of business.

The Status Quo Bias

"Loss aversion" describes an observed phenomenon from the field of psychology that is also evident in game theory. Economists assume that efficient markets define a clearing price as the point at which rational players are indifferent between buying and selling a given item. Psychologists, on the other hand, have observed consistent asymmetry, which they label the "status quo bias."

In an experiment by William F. Samuelson and Richard Zeckhauser detailed in a 1988 *Journal of Risk and Uncertainty* article, individuals were presented with a set of options and asked to select the one they preferred. The researchers discovered that preference for an option increased when it was presented as the status quo. For example, the economists randomly distributed coffee mugs and candy bars to students, after querying them on their preferences for and asking them to assign values to each (defining what economists call utility curves). The professors then asked the students to exchange the products, so each could gain his or her preferred option. The students proved unwilling to part with their merchandise at the prices they had set before they received the tradable items — behavior incomprehensible to the economist modeling the "rational man."

Instead, they requested more than their original impersonal valuation to exchange the goods.

Research has shown the preference for the status quo increases with the number of alternatives presented. As noted by Richard H. Thaler in his 1992 book, *The Winner's Curse: Paradoxes and Anomalies of Economic Life*, people do not weigh the risk of loss and the opportunity for gain equally. Choices posed as having a 50 percent probability of failure consistently rank lower than choices described as having a 50 percent probability of success.

This status quo bias clearly serves the interests of the customer conducting online auctions. An incumbent supplier will likely bid aggressively because of the status quo bias, suggesting that auctions will tend to go to the incumbent supplier — but at a reduced margin. Despite the desire to aggressively drive price reductions, most purchasing professionals fear the risk inherent in adopting a new supplier. Keeping the incumbent while reducing the incumbent's price offers the corporate version of having your cake and eating it too.

Yet bidding down the margins of an incumbent (but competitively disadvantaged) supplier could lead to ruin for both the customer and the supplier. If an incumbent supplier of labor-intensive goods with an expensive union contract wins auctions by matching the pricing of a challenger that employs low-cost labor in a developing county, the incumbent will ultimately follow a path to bankruptcy. Destroying the supplier could leave the customer without a dependable source — so both must be wary of the status quo bias. This tendency to award bids to an incumbent could also thwart warranted changes in the supply base.

Predictions for Online Auctions

So what do these theoretical lessons offer for participants in online B2B auctions? The research and our own experience suggest that initially, online auctions will yield savings — although in some cases because of classic game theory errors. Over time, suppliers will learn the game and may eventually come to dominate it, leveraging information historically unavailable to them.

Game theory argues that bidders will settle upon the Nash Equilibrium and price to minimal margins to win business. New suppliers will succumb to the Winner's Curse by bidding too aggressively on products they think they can manufacture profitably. Just as oil companies overestimated the value of a plot in an oil field, suppliers in an online auction risk underestimating the cost of serving a particular company or manufacturing a new part. As added pressure, incumbent suppliers will likely fall prey to the status quo bias and respond aggressively in the online frenzy as well.

In the near term, these dynamics will clearly produce price reductions for the buying company. And more often than not, the buyer will stick with the existing supplier rather than switch to an unproven source. Therefore, buying companies employing online auctions will generally not face the hidden costs of buying from a new, lower-priced supplier while incurring higher total costs due to increased expenditures for new supplier development or increased material rejections. The increased price pressure will drive all suppliers to reduce costs to avoid the margin squeeze. The best suppliers will be successful, which should make the supply base leaner and stronger.

Over time, however, suppliers will learn the new rules of the game, just as many figured out how to work with the buyer-imposed technique of "open-book costing" and year-on-year "productivity" targets during the 1990s. Back then, the savvy supplier offered a second set of books that hid costs in the places least likely to receive scrutiny. Suppliers also saved improvement ideas to respond to future productivity demands, providing customers an illusion of continued savings. In the new era of online auctions, clever suppliers will again discover how to demonstrate the illusion of savings, keeping the purchasing agent happy, while protecting margins to keep shareholders happy.

Suppliers shouldn't seek only to win the business, but to gain an attractive return.

Despite the new gamesmanship, the weakest suppliers — those unable to find cost savings to offset initially lower prices — could fail if the learning process takes too long. The surviving suppliers will have better competitive information than ever before to profit from the reduced competition. Able to observe competitors' pricing strategies in real time, with every event, the most sophisticated suppliers could learn to use this information exchange to their advantage — maximizing their pricing when advantaged and signaling a desire to avoid cutthroat competition when at parity. In such a scenario, power would shift from the buyer to the seller, reversing the original intent of the online auction.

The Tool Shouldn't Rule

The online auction offers a new tool in the purchasing arsenal that no company can completely ignore. But beware the tool becoming the master. Use online auctions to identify the truly advantaged supplier rather than the bigger fool falling for the Winner's Curse. Make sure that the underlying economics support aggressive bids. A strong supplier competing aggressively with other strong suppliers encourages innovation and continuous improvement. A supply industry dominated by a single supplier encourages atrophy.

Equally important, a company must find ways to collaborate with the supply base to jointly eliminate waste. Reducing a customer–supplier relationship to a single pricing point on a computer screen ignores this critical dimension. Even in the Internet era — which managed to avoid market rationality for a time — the traditional necessity of balancing cooperation and competition remains. ✚

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