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# Is Trust the Whole Story? Rethinking Online Auction viaNetwork Exchange Theory

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## Abstract

*It is generally accepted that trust has main effects on the final prices in online auctions, and that trust-building techniques are important for guiding auction behavior. Previous empirical studies, however, did not find strong evidence to support this. A possible reason is that available studies are based upon the dyadic relationship between sellers and bidders, but the social networks embedded in the auctions are overlooked. Based on the Network Exchange Theory, this research investigates the impact of social networks on the bidding prices, and re-examines the role that trust plays in online auctions. It suggests that both the competition among bidders and previous auctions of similar merchandises have direct impact on the final price, and that trust influences the price indirectly through its impact on participation in bidding. A preliminary empirical study is conducted to test these hypotheses, and the result supports the conceived impact of social networks. This study provides a new approach to online auction research and extends available knowledge on bidding behavior.*

**Keywords**: Online auction, trust, social network, Network Exchange Theory, payoff

## Introduction

Trust and reputation are widely recognized major factors that influence online consumer behavior (Bhattacherjee 2002; Gefen et al. 2003; McKnight et al. 2002). In online auctions where the potential risk is high due to uncertainty or incomplete information (McAfee and McMillan 1987), trust and reputation are proposed to have main effects on final prices (Ba and Pavlou 2002; Houser and Wooders 2001; Pavlou and Ba, 2000). Previous empirical studies, however, did not find strong evidence: trust and reputation are found to have no or weak effect on some merchandises (e.g., Ba and Pavlou 2002). A possible reason for this mixed result is that available studies on online auction are based on the dyadic relationship between sellers and bidders, but the social networks embedded in the exchange relationships are overlooked. Based on the Network Exchange Theory (Willer, 1999), this research investigates the impact of social networks on online auction, and re-examines the roles of trust in the bidding process. A new model of price determination is then developed and tested with empirical data. This study has contributions to not only the knowledge of online auctions, but also the application of sociology theories in Information Systems (IS) research.

## Studies on Online Auction

As one of the most successful applications of Internet technology, online auction has become an important economic form since its inception in the last decade. At the same time, academic research has begun to focus on this new phenomenon. Studies have analyzed such issues as consumer's intention to bid (e.g., Stafford and Stern, 2002) and, most importantly, the factors that influence the final price (e.g., Mehta and Lee, 1999; Ward and Clark, 2002). Except for the attributes of the products on auction, several factors related to the bidder's behavior have been analyzed, including bidders' experience and methods of bidding (i.e., proxy bid or minimum-increment bid, see Ward and Clark, 2002), length of auctions (Houser and Wooders 2001), and trust and reputation (Houser and Wooders 2001; Pavlou and Ba, 2000). Among these factors, trust and reputation are thought to be the most important, for about 63% of the frauds on the Internet are related to online auctions and consumers intent to pay lower prices to dishonest sellers in order to compensate for the transaction risk (Ba *et al*, 2003). To prevent fraud, trust-building mechanisms have been used in major online auction markets, such as eBay's Feedback Forum. As trust cannot be readily measured in auctions and reputation is a major source of trust, reputation is often used as the proxy of trust in empirical studies (Pavlou and Ba, 2000). In eBay's Feedback Forum, for instance, reputation is primarily built through the rating systems, as shown by the number of positive, neutral, and negative ratings for a seller or bidder.

Although the emphasis on trust complies with bidders' rational, risk-aversion behavior, previous empirical studies did not find strong evidence for this. For instance, Ba and Pavlou's (2002) study shows that the impact of negative ratings (indicators of a poor reputation) on price is insignificant in 16 out of 18 products, which is different from the result of their online field experiment. The impact of positive ratings is moderately (13 out of 18) significant. Another study by Kauffman and Wood (2000) shows that reputational score is irrelevant with price. Why does this happen? One reason is that available studies on trust are primarily based on economic and socio-psychological theories that are capable of interpreting bidder's risk-aversion behavior. These studies assume that bidders will offer a proper price based on their trust of the seller when information about the product is incomplete. If they believe that the seller is trustworthy, they will offer a higher price to ensure the transaction; otherwise, if they believe that the seller is dishonest, they will offer a lower price to offset possible risk. Such risk-aversion behavior directly influences the bidder's belief or expectation of an ideal price, but not the final result. It works well in sealed-bid auctions, but not in open-bid auctions where the latest price is visible to everyone (Rothkopf and Park, 2001). Observations on online auctions show that many bidders (including the winning bidders) do not offer just one price, but rather increase the price incrementally until they win or give up. Furthermore, the bidder's previously anchored expectations will be adjusted (Switzer III and Sniezek, 1991) during the auction process. As Rothkopf and Park (2001, p.86) state, "If a bidder can infer from observing other bidder's bids something about how valuable an item would be to her, she can afford to compete more aggressively, and the final price may be higher." Therefore, trust alone does not explain this bidding behavior.

An important issue overlooked in these studies is the social networks embedded in the exchange relationships. It is clear that a bidder not only offers a proper price to the seller, but also competes with other bidders in order to win. The interactive relationship between bidders and sellers forms a typical social network. As many bidders bid for scarce products, such an embedded social network influences bidder behavior, and thus the allocation of payoffs between winning bidder and seller. Several competing theories such as core theory, equidependence theory, and expected-value theory, etc., have been compared for their explanative power in analyzing the social exchange relationship (Skvoretz and Willer, 1993), and the Network Exchange Theory (Willer 1999) is found to be the best. In this research, the Network Exchange Theory is applied to analyze the impact of social networks on online auctions. To our best knowledge, this theory has not been applied in IS research. Therefore, a brief introduction is made first.

## Network Exchange Theory: A Brief Introduction

Network Exchange Theory (Willer 1999) analyzes the exchange relationship between positions in recursive, one-exchange networks where each position may exchange at most once at a time. Multiple-exchange relationships, nevertheless, can be extended from the simple form. Like other social exchange theories, it analyzes the *power status* of positions and their corresponding payoffs. A position that earns more payoffs than its exchange partner is said to have strong power; otherwise it has weak power. This theory suggests that *exclusion* determines the power status of a position: a position that can *never* be excluded from the exchange has strong power; otherwise it has weak power. Figure 1 gives an example. There are five positions (A1, A2, B1, B2, and B3) in this network model. Each straight line stands for a possible exchange relation. Both A1 and A2 have three exchange possibilities. Since each of them may exchange with only one B, none of them is excluded. On the contrary, B1, B2, and B3 each has only two exchange relations, so that at each time there is a B position that is excluded. An *Equal Resistance Principle* (Willer 1999, p43) is proposed to calculate the payoffs between A and B:

$$\frac{P_{A\max} - P_A}{P_A - P_{Acon}} = \frac{P_{B\max} - P_B}{P_B - P_{Bcon}}$$

where $P_{Amax}$ and $P_{Bmax}$ stand for the maximum payoffs A and B desire, and $P_{Acon}$ and $P_{Bcon}$ represent the minimum payoffs A and B request. Given the total payoffs to be allocated between A and B, the actual payoffs they earn, which are $P_A$ and $P_B$, are determined. In a recursive exchange network, a position being excluded in previous transactions will lower its expectations so that it has a higher chance to win but with smaller payoffs. Similarly, a position winning previous transactions will expect at least the same amount, thus having a chance to win more. As this anchoring-adjusting process continues toward equilibrium, strong power positions will earn the maximum payoffs while weak power positions earn the minimum. The payoffs are determined by the structure of the exchange network and the position of each player.

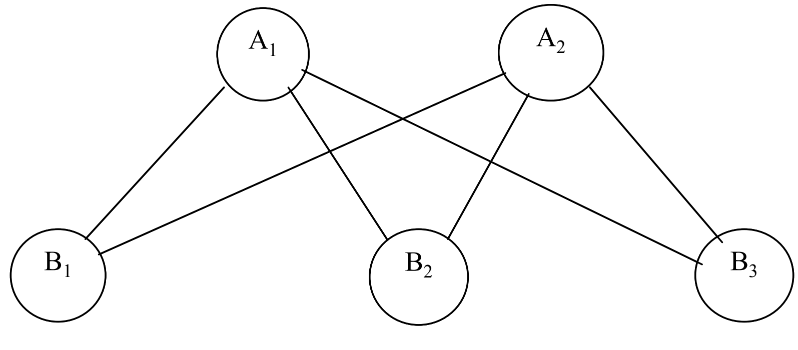


**Figure 1. Example of an Exchange Network**

Online auction is a typical exchange relationship, where many bidders (B-positions in Figure 1) compete for a limited amount of products from a small portion of sellers (A-positions). An example is used to illustrate how the Network Exchange Theory is able to explain the changes in the bidding price. A single auction is analyzed. Suppose a product is on auction, which is also being sold in non-auction market with a price of P. The consumers may buy it directly from the non-auction market, or bid online. If they bid online, they will divide the total payoff of P with the seller. As the bidders expect to save money from online auctions, the final price will not be P but below it. Suppose the expected saving is S (P > S). If there is no opportunistic behavior in the auction, the final price will be exactly (P-S). However, since there exists opportunistic behavior, some bidders will expect to save even more. The question is: What is the final price? Suppose there is no reserved price so that the seller will accept any offer, even just one cent. Therefore, when the auction begins the seller will expect a highest price (i.e., seller's payoff) of (P-S), and a lowest price of almost zero if all bidders behave opportunistically. Correspondingly, the bidders will have the potential to save (i.e., the winning bidder's payoff) at least S and at most P, given the total payoff of P. Based on these conditions ($P_{Amax} = P-S$, $P_{Acon} = 0$, $P_{Bmax} = P$, $P_{Bcon} = S$, and $P_A + P_B = P$) and the equation above, a reasonable initial allocation of payoffs between seller and bidder will be $P_A = (P-S)/2$ and $P_B = (P+S)/2$, where the seller's payoff $P_A$ equals to the price.

As the latest price of this auction is displayed on the web and $P_B > S$, it means that the bidders' bottom line has not been reached, so that other bidders will take the opportunity to offer a better price to outbid the first bidder. As the seller cannot "negotiate" with the bidders, his/her expected maximum and minimum payoffs do not change. As for other bidders, they know that they will not win unless they earn less than $P_B = (P+S)/2$, so that the maximum payoff for other bidders will be $P_{Bmax} = (P+S)/2$, meaning they could not save more than (P+S)/2. As other conditions remain constant, a new (reasonable) price offered by the second bidder will be $P_A = 2(P-S)/3$ and $P'_B = (P+2S)/3$. As P > S, it follows that $S < P'_B < P_B$, implying that there is space for the price to go up, and $P'_B$ becomes the new maximum payoff expected by other bidders. It can be proved that the process stops at $P_{Bmax} = P_{Bcon} = P_B = S$, or the minimum anticipated savings. Therefore, the effect of the initial opportunistic behavior is offset by the competition.

The above analysis shows that, *ceteris paribus*, the final price is uniquely determined by the anticipated saving of the bidders; i.e., the equilibrium price will be (P-S). The equilibrium is driven by both the anticipations of the sellers and bidders and their positions in the social network embedded in auction. The above analysis is based on an ideal situation where the bidders' overall expectations are used to calculate the equilibrium point. In practice, however, three factors may influence the outcome: (1) for a specific auction, different bidders' anticipated saving is different, so that the equilibrium point is hard to capture; (2) since the same kind of products may be auctioned many times, whether expected saving will remain the same or change over time is not considered; and (3) even in the same auction, it could be argued that the equilibrium or expected saving might not be reached when the auction closes. Thus, the application of the theory should be revised to incorporate these influential factors.

## A New Model of Price Determination

Previous studies on online auction based on economic theories and social-psychological theories have their weakness in predicting auction price. The major reason is that the social network embedded in the auctions is not considered. The above analysis based on the Network Exchange Theory suggests that the competition among bidders, given that the sellers will accept any offer, will drive the price up to just fulfill the minimum expected saving. Therefore, the expected savings would uniquely determine the final price. As equilibrium is achieved through competition, we expect that the more intensive the competition, the faster the price approaches the minimum saving-determined equilibrium.

However, as incomplete information and opportunistic behavior exist, the impact as well as the nature of the minimum saving goal should be carefully considered. Two conditions must be considered: (1) whether the bidders as a whole are able to offer the highest price when the auction closes; and (2) whether the bidders, including the one who eventually wins the auction, are able or willing to offer their highest price before the auction closes. A potential factor that influences the first situation is the length of auction. A study by Houser and Wooders (2001), however, found that the length of auction had no effect on the final price, but rather its variance. Thus, we assume that the auctions will end with the expected savings for the bidders as a whole, and the fluctuation in empirical data can be offset by large sample. The second situation is more complicated, since the winner might win with a price lower than his/her anticipation; i.e., the winner might have had low expectation before the auction but wins with a fortune. In the current study, we assume that at least the second-highest price reflects that bidder's true expectation, as he/she gives up only at the last moment. If the winning bidder uses increment bidding, the final price is usually the second-highest price plus the minimum increment. Therefore the second assumption can be applied to the final price as well. Based on these analyses, we propose that the expected saving is negatively related to the final price and that the number of bids as a proxy of the intensity of competition is negatively related to the expected saving.

The Network Exchange Theory suggests that when the total payoff is constant (i.e., auctions of identical or quite similar products), the equilibrium status is determined. In practice, however, several identical or similar products are usually auctioned successively. In this situation, we do not assume that the expected saving would be exactly the same, because of the anchoring and adjustment effect in people's decisions (Switzer and Sniezek, 1991). In other words, the longer a bidder waits, the more savings he or she expects. Bidders competing for similar products over successive auctions expect more savings and lower prices in successive auctions. Another reason for this enhanced expectation is the cumulation of bidding experience (Ward and Clark, 2002). Accordingly, we propose that auctions of identical or similar products over time will lead to higher expected savings and then lower prices.

This research does not negate the importance of trust in online auctions. Nevertheless, the role of trust must be reconsidered in the new framework. As trust is a bidder's belief or attitude toward a seller, it might have an indirect effect on actual bidding behavior and thus final prices. Specifically, we propose that trust has both direct and indirect effects on final prices, and the indirect effect is made through its influence on the number of bids: the higher the trust, the more bids.

So far we have analyzed price determination for identical products. When different products are involved, we expect that the product attributes, e.g., expensiveness (Ba and Pavlou, 2002), will also influence final price. Two attributes are considered, i.e., the popularity of the product and its non-auction market price. Specifically, we propose that product popularity is positively related to the number of bids, and its non-auction market price is positively related to final prices.

The overall conceptual model is shown in Figure 2. We see that expected saving works as the core factor that determines the final price. In empirical studies, however, this expected saving is difficult to observe. It can only be measured in lab experiments where control is available. Based on the assumptions above, we use the final price in each auction as the surrogate of the expected saving in empirical research. The conceptual model also shows that product attributes influence final price directly and indirectly. In order to estimate the influence of these factors, more data would have to be collected from different products. In this research, however, we only concentrate on the major part of the conceptual model and examine auctions of identical products. Considering such practical issues, we propose four hypotheses for the current empirical research, based on the conceptual model:

**H1**: The number of bids is positively related to the final price of an auction.
**H2**: For identical products, the earliness of the auction is positively related to the final price.
**H3**: Trust is positively related to the number of bids in an auction.
**H4**: Trust is positively related to the final price of an auction.

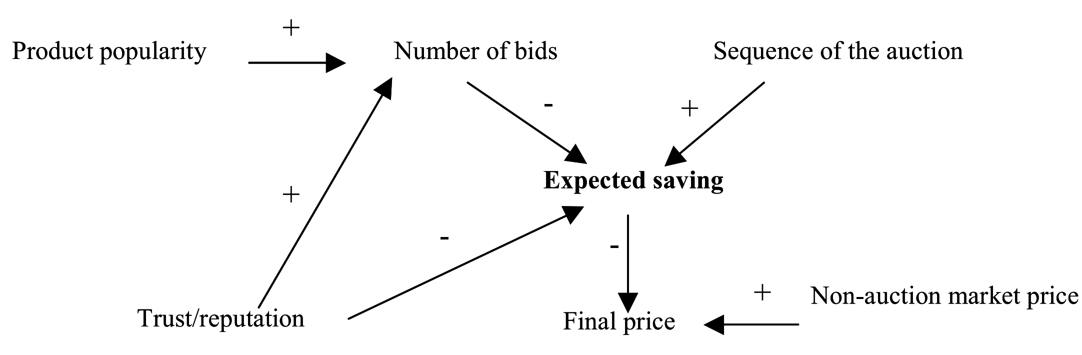


**Figure 2. Conceptual Model**

Figure 3 shows the research model in this study.

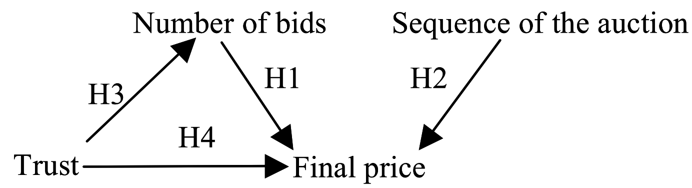


**Figure 3. Research Model**

## Research Design

A preliminary study was conducted, where empirical data were collected from 72 auctions of Dell UltraSharp 1800FP monitor at eBay in March 2003. Of these auctions, there are 41 different sellers of which 24 have all positive ratings, 5 have neutral but no negative ratings, and 12 have negative ratings. Table 1 shows a brief description of the data.

**Table 1. Description of the Empirical Data**

| | |
|---|---|
| Range of final price: \$454.95-\$514.00 | Range of bids: 2-79 |
| Average of final price: \$478.81 | Average of bids: 22.71 |
| Standard deviation of final price: 12.62 | Standard deviation of bids: 9.98 |
| Average number of positive ratings: 186.1 | |
| Average number of neutral ratings: 2.07 | |
| Average number of negative ratings: 1.54 | |

As the influence of reputational ratings is proposed to be non-linear, logarithmic transformation has been used in previous studies (e.g., Ba and Pavlou 2002); the same treatment is applied in this study. As the effect of number of bids mediates the effect of trust, we test H4 first. The regression model shows that none of the three reputational ratings is significant (p-value = .430, .897, and .800, respectively). Thus H4 is rejected. To test H1 and H2, the number of bids and sequence number are used as the independent variables. The result shows that both the number of bids (β = .394, p-value = .006) and the sequence number (β = -.157, p-value = .020) have a main effect on final price ($R^2$ = .178); thus H1 and H2 are supported, suggesting that competition instead of trust determines the final price, and the market as a whole learns from the previous auctions. To test H3, we use the number of bid as the dependent variable and the logarithmic transformation of three types of reputational ratings as the independent variables. The result shows that none of them is significant; thus, H3 is rejected.

## Discussion

This research is based on the Network Exchange Theory, and focuses on the central roles of expected savings on final prices. Several limitations exist in this research. First, the expected saving, which is the core construct in the conceptual model, is not observable in empirical research. Although lab experiment could be conducted to test the existence and impact of this construct, its validity in practice is inevitably influenced. A better surrogate of this construct rather than the final price needs to be identified. Second, the research model is built solely around the Network Exchange Theory and uses some new constructs; other theories or empirically tested constructs are not properly integrated. Therefore, the explanatory power of the model is restrictive. Third, the preliminary study is based on a single brand-named new product, for which there is a strong price competition. Also, its non-auction market price is available for benchmarking. Therefore, whether the result could be generalized to other products such as collector's items or second-hand products is not known. Trust and reputation might have strong effect on those products, which needs further investigation. These limitations are to be solved in further research.

Within these limitations, the statistical analysis shows that trust is not important to the final price (at least for the current product), and it does not even have impact on the number of bids. There are two explanations of this result. First, what is trusted should be reconsidered. Do the bidders trust the seller, or the product they bid for? Since the product analyzed here is very popular, there are numerous bidders in each auction. The result is that the effect of seller's reputation is overwhelmed, and it is the product instead of the seller that is trusted. Second, as competition determines final price, once competition exists the final price must be pushed up to the level that the market could endure.

Our study has an important contribution to the academic research. It is the first research that applies the Network Exchange Theory to IS research. It has the promise to solve the controversies associated with social network-based exchange relationships in business environment. It suggests that the analysis of the exchange relationships should be extended from dyadic relationship to the influence of third parties. This is important in applying Information Technology to facilitate social exchange. The second contribution is for online auction research. Previous economic theories-based studies focus on analyzing consumers' one-time, opportunistic behaviors; the current research is focused on the long-term recursive relationship between bidders and sellers. Therefore, the integration of both research directions has the potential of constructing a holistic picture of online auction. For instance, this research implies that economic theory might be used to theorize the formation of minimum saving goal used in the equation of the Equal Resistance Principle.

The practical implication of our analysis is twofold. First, competition is the major factor that drives the final price of an auction. Since online auction markets need not only large numbers of bidders but also plenty of sellers, to achieve high price is important to attract more sellers with more products. Facilitating competition is the way to ensure high revenue and attract sellers. Second, helping the bidders better learn about the market is very helpful for them to bid wisely. Some mechanisms, such as eBay's *myBay*, allow customers to watch as many as 30 items simultaneously. This function will undoubtedly help the bidders to capture market information promptly and make decisions correctly. Accompanied with other mechanisms such as the Feedback Forum, these mechanisms could further motivate online auction business.

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