

Security and Trust of Online Auction Systems

Pouwan Lei

University of Sussex, UK

Chris Chatwin

University of Sussex, UK

Rupert Young

University of Sussex, UK

INTRODUCTION

An auction is a market with an explicit set of rules determining resource allocation and prices on the basis of bids from market participants (McAfee & McMillan, 1987). Generally speaking, an auction is the standard means for performing an aggregation of supply and demand in the marketplace to effectively establish a price for a product or service. It establishes prices according to participants' bids for buying and selling commodities, and the commodities are sold to the highest bidder. Simply stated, an auction is a method for allocating scarce goods, a method that is based upon competition between the participants. It is the purest of markets: a seller wishes to obtain as much money as possible for the commodity offered, and a buyer wants to pay as little as necessary for the same commodity. Traditionally, there are three protagonists in the auction: sellers, buyers, and auctioneers. An auction offers the advantage of simplicity in determining market-based prices. It is efficient in the sense that an auction usually ensures that resources accrue to those who value them most highly and ensures also that sellers receive the collective assessment of the value. Indeed, auctions are conducted in accordance with formal rules for governing market access, trade interaction, price determination, and trade generation (Friedman, 1993). In the case of a traditional physical auction, a seller will choose an auction house based on the service: the form of licensing, the availability of suitable insurance, suitable descriptions and access to the commodities, payment terms, and security of goods before and during the auction process. The buyer or seller needs to come to the market or send his/her representative.

Online auction systems provide immediate access advantages compared with their physical auction systems counterpart. Participants may join an online auction system, effectively placing bids using a computer on an anywhere-anytime basis. The access is not only limited to desktop computers, but also handheld devices such as mobile phones. In online auctions, transactions take

place based on information (product descriptions), and the products move from seller directly to buyers only after online transactions are completed. They facilitate buyers and sellers in: meeting, the listing of items for sale independent of physical location, exchanging information, interacting with each other, and ultimately completing transactions. They offer significant convenience, allowing trading at all hours, and provides continually updated information; and they allow buyers and sellers to trade directly, by bypassing traditional intermediaries and lowering costs for both parties. Online auctions are global in reach, offering buyers a significantly broader selection of goods to purchase, and provide sellers with the opportunity to sell their goods efficiently to a broader base of buyers. Factors that make online auctions attractive may also present disadvantages. Many online auctions simply list the items for sale. No attempt is made to verify and check that the merchandise actually exists or that the description is accurate. Transaction trustworthiness and security are the two most significant problems.

EXISTING PROBLEMS

Online auctions have become very popular. One of the most successful online auctions, eBay (www.ebay.com) purports that the number of active users worldwide has increased from 27.7 million in 2002 to 41.2 million in 2003, and the number of listings was about 292 million in 2003 (eBay, 2004). Nielsen/Netratings, the global standard for Internet audience measurement and analysis, also reports that eBay was one of the top five sites in Germany and the United Kingdom in February 2004 (Nielsen/Netratings, 2004). The research firm, the Aberdeen Group, found that 94% of net market transactions were through auctions, with just 6% through catalog sales (Pritchard, 2002). Most auctions are open to the public. Whatever you want, you can find. Given the rapid success of the virtual market, no de facto standards exist as to the bidding rules and policies governing the online auction business. Although

online auctions have been developing for many years, there are still two major problems: trustworthy transaction and security. Regarding the first problem, trustworthy transactions, many auction sites describe themselves merely as meeting places for buyers and sellers. They simply allow sellers to list merchandise offered for trade and do not verify that the merchandise actually exists or is accurately described. They only use an email address to identify the traders—buyers and sellers. After the auction is over, it is the seller's responsibility to deal directly with the buyer concerning payment and delivery. The auction companies do not hold any responsibility for the transaction. Auction fraud is therefore an increasingly difficult problem in the virtual market. The common types of auction fraud are as follows (National Consumer League, 2001):

- i) Failure to deliver: Buyers pay for an item, which is never received.
- ii) Misrepresentation: Items received do not match up to the original description.
- iii) Shill bidding: A seller, or an associate, places a fake bid intended to drive up prices.
- iv) Selling black-market goods: The goods are typically delivered without authentic merchandise, warranty, or instructions.

Among the complaints that the Federal Trade Commission (FTC) received about auction fraud, the two most frequent are 'failure to deliver' and 'misrepresentation'. However, in the last few years there is a new trend of increased 'shill bidding'. These problems effectively prevent some Internet users from participating in Internet auctions. According to FTC's Auction Fraud Report, Internet auction fraud entails 64% of all Internet fraud that is reported (Enos, 2001). The total dollar loss for all complaints exceeded US\$12.3 million. Internet auction fraud has become a significant problem.

The second problem, security, is naturally a big concern for any business on the Internet. Since data is being transported over public networks, this makes it possible for third parties to snoop and derive critical information. Security and safety is an important topic in conducting business on the Internet; online auctions are no exception. During the auction, buyers and sellers have to submit their personal information to the system, as well as provide electronic payment for their goods. Hundreds and perhaps thousands of credit card numbers, home addresses, and phone numbers were exposed for months through a security hole on many Internet auction sites. Few auction sites provide security features such as SSL and VeriSign security. In the survey of protections on smaller auction sites, there is less than 20% implementing security technology (Selis, Ramasastry & Wright, 2001).

Furthermore, most online auctions do not enforce strong authentication, relying instead on a user ID and password, or may be an email account, to establish the validity of a client. Once this minimal information is supplied, people are free to enter into the online auction system and participate in bidding. Moreover, no minimally acceptable standard exists for ensuring that auctioneers protect users against the loss of personal information by the auctioneer. There are no established minimum-security standards or licensing bodies to protect the privacy rights of customers. People are risking their personal information. Ensuring security and trust in electronic communication is a principle requirement for achieving the trust necessary in gaining widespread acceptance of Internet auction systems as a medium for commerce.

SECURITY & CONFIDENTIALITY

The challenge in security is to build an online auction system (OAS) with safe communication and collaboration between legitimate users. The following sums up the fundamental security needs for OAS:

- i) The need to identify and authenticate legitimate users, thus identifying and granting access to bid information, content, and supporting services.
- ii) Provision of a security system with fine-grained access control that will allow, on the one hand, legitimate users access to resources, while on the other, protecting sensitive information from hackers and unauthorized users (i.e., all other users).
- iii) OAS should ensure that private, tamperproof communication channels for auction participants exist. Hence, processing of their transaction is secure.
- iv) OAS should provide auditing and logging facilities to track site security and misuse.
- v) OAS should provide secure data transactions from sellers to OAS and from OAS to buyers.
- vi) Database system security is another consideration in OAS. In order to make sure that no unauthorized or authorized user can access any data in the database system, OAS should clearly identify data held, conditions for release of information, and the duration for which information is held.

Authentication is often considered the single most important technology for OAS. It should be computationally intractable for a person to pretend to be someone else when logging into an OAS. It should be virtually impossible for a third party to alter e-mail addresses, digital signatures, or the content of any document without detection. In addition, it should be equally

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