Proceedings of the International Multiconference on
Computer Science and Information Technology pp. 407–413

ISBN 978-83-60810-14-9
ISSN 1896-7094

An examination of factors affecting bidders' choice in electronic auctions

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***Abstract*—The increment of number of services provided in World Wide Web lately drives more and more consumers to e-commerce. During the last years and due to the vast increase of e-stores (B2C), electronic marketplaces and electronic auction sites became more popular. Many researchers examined how buyers interact with the auction facts and sellers during the procedure. Questions such as "how do millions of users decide about their e-bidding" and "what are the factors affecting them and what is their order of importance" are amongst the most significant ones in current research.**

In this paper these factors are initially located using auction literature and eBay interface as well as expanded with the addition of a new factor (communication with seller). Their weights derive from the statistical analysis of the answers given in a questionnaire that was filled electronically by eBay users during the period of February – March 2007.

I. Introduction

E-AUCTIONING has raised some really interesting questions during the later years including the following:

- What are the unrelated factors affecting the eBay users to bid on an item?
- How important is each one of them for the decision maker?
- Do these factors have the same weight or does it change under different circumstances?

E-commerce latest standards instead of the traditional e-shops and on-line catalogs are e-auctions web sites. On-line auctions allowed a brand new model of data interchanging (C2C) to grow up rapidly during the last years. Consequently, a new theoretical and research field has been inaugurated, trying to interpret the physiology of on-line auctions.

Initially, there was an effort to describe e-auctions in comparison to traditional physical auctions and an analysis of the characteristics of the seller was also made [1], [2], [3], [4]. As the e-auctions evolvement continued, it was necessary that the factors affecting the buyer and their results being analyzed [5], [6], [7]. An interpretation of the buyer's behavior was also made based on those factors and on how can he or she decide for the same item between 2 auctions [8], [9].

In this paper e-auctions are examined from the buyer's view. All factors affecting the buyer that were examined previously are gathered and ranked by importance according to users' opinion. For the statistical facts, we are based on the results deriving from the comparison of 2 different questionnaires, one filled in September/October 2006 and the second filled in February/March 2007.

In section II the electronic auctions literature so far is presented while in section III the factors investigated in this paper are analyzed and how they affect the buyer to bid on an item. In sections V the results of the statistical analysis are presented and finally, conclusions and further research for future discussion are incorporated in section VI.

II. Auction Theory

As Milgrom and Weber pointed, [9], introducing affiliated values (AVs), evaluation of an item under-auction is a result of objective but also personal factors. Especially when the item is bought not for resale but for personal and often collective purposes it is clearly a subjective issue, [3]. Therefore electronic auctions must be criticized not only on auction but on the bidder level too.

The various characteristics of on-line auctions and sellers investigated in [3], [10], where explained how they are converted into factors affecting the buyer in comparison to a physical auction.

Vakrat, [6], expanded the research on how much consumers were willing to pay for identical products offered through on-line auctions instead of on-line catalogs. The authors findings suggest that bidders prefer shorter auctions and expect larger discounts for expensive items, while their second study [7] concludes that most bids are made during the first half of the on-line auction, and that high starting bids result in fewer bidders and vice verse.

Bapna, [11], later categorized the bidders into types—evaluators, participators and opportunists—and describes their behavior during bidding.

Seller feedback rating has been widely discussed as a factor in many studies, [12], [10], [13], as well as long-time users usually bid on an item before the auction ends, [14].

It is also known, [8], that the starting bid of an auction, the number of negative comments and the length of the auction all affect the final price of the item.

In the same paper, [8], using data from 55,000 bids over a 3 years period, auctions of identical items that took place during different periods are examined. Kauffman and Wood found factors that affect bidders making them willing to pay more for the same item that are the existence of an image,

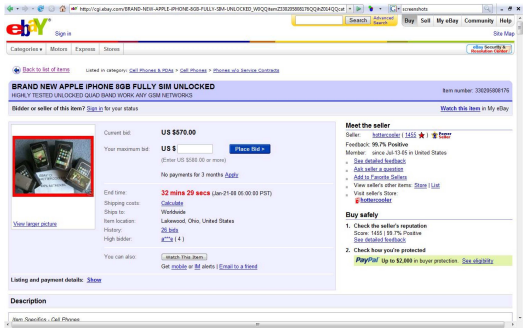

Fig. 1. The main eBay bidding screen. Time is ticking, all factors are presented and the item is waiting for yet another bidder.

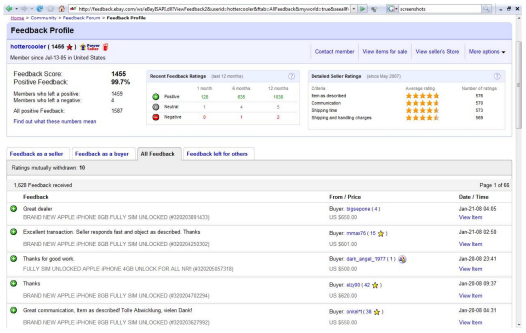

Fig. 2. Bidders can read comments about all the seller's past transactions. They will give notice to the negative ones.

seller experience, whether or not the auction ends on weekend and previous bids (herd effect).

III. Factors Affecting an eBay Auction

In this paragraph the most important factors affecting the buyers on an on-line eBay auction are introduced.

As presented in Fig. 1, a typical eBay bidding screen, bidders show all the information about the item and the seller in order to bid for an item. Items current price, time until auction ends (and the exact date and time it will end), seller feedback, description, item images, payment methods and other users bids are all there. Note that asking the seller a question about the product and the transaction is always an option for the bidder until the auction ends.

It is already known that the price of the item listed is the most important factor affecting an eBay auction. In this paper the desired price satisfying the bidder so as to buy online is to be located, expressed as a percentage of a physical store's price for the same item (discount). Moreover, we are trying to ascertain whether or not the bidder has a different discount requirement in comparison to the final price and also according to the item condition.

Time is also considered to be an important factor concerning eBay auctions, while it is connected with both price and the number of bids. More specifically, time is observed since the beginning of an auction and we are trying to locate the moment most buyers chose to bid.

In Fig. 2 a full seller's transaction history is presented and bidder is given the opportunity to read all the comments other bidders made about their purchases from the seller, positives or negatives. After each won item of an auction and the end of the transaction between buyer and seller, the former is obligated to leave a positive, negative or neutral comment (feedback) about the seller and the services he or she provided. The percentage of positive over negative comments is the seller feedback rating, which we is used to examine how it affects the buyer so as to bid for an auction.

Another recently introduced factor is how prior bids from other possible buyers on the same auction affect the bidder; thus it is interesting to find the bid ratio required to confirm our hypothesis. Supposing two auctions of the exact same item exist and share 10 bids, it is examined for what proportion will

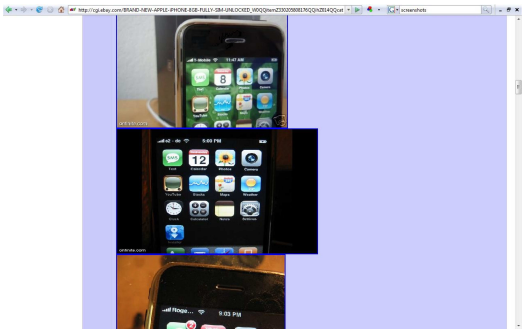

Fig. 3. Several high resolution photos are needed between words.

the buyer prefer one of them (i.e. 6 bids for the first auction over 4 for the second or 8 for the first over 2 bids for the second).

In Fig. 3, a sample of large resolution images of the item used in the item's description can be observed. Note that images are "real" (of the specific item auctioned) and not taken from the item's manufacturer (i.e. from the company site). Image existence is also significant to the buyer's opinion on the item. The current findings on the topic is expanded by examining how it affects the buyer and whether or not more than one photo affects more. There is also a classification concerning the item condition (new item / used item in excellent condition / used item in good condition).

Except for the item's image existence and length, it is of equal importance to examine what is the item's description specific role in the bidders decision. Fig. 4 shows the importance of the description's extent in an auction. In this auction case, seller uses a large description of the item auctioned to persuade other users to bid on it, explaining the item's specifications and condition. It is examined (in relation to the item's condition: new item / used item in excellent condition / used item in good condition) whether and how a more detailed description in the item's presentation affects the buyer against a more concise one with less information about the item.

One factor that always influences eBay buyers is the way they have to pay for an item they bid on. The most popular way to pay for an eBay item is examined. It is noted that every auction on eBay can have one or more accepted payment methods that affect the bidder's choice.

Fig. 4. Description can be up to several pages, so as to persuade the bidder that "it's the real thing".

In holidays (non-working days) Web and thus eBay traffic is increased while users have more free time. It is attempted to investigate the effect of the phenomenon and whether or not the probability of a buyer to make o bid for an item auctioned on eBay is also increased on holidays.

Finally, another important factor affecting on-line auctions is the communication during the auction between the 2 parts (buyer and seller). The seller's ability to respond to the buyer's questions about the item auctioned affects the prospect of the latter to bid for it.

IV. Methodology

This essay is based on answers collected by eBay users using a questionnaire and examines the factors that affect the bidder during his/her decision to bid on an eBay auction item. Although all the factors mentioned by previous authors are gathered, we again examine all points of an auction that could possibly irritate the bidder. We also rank them by levels of importance based on our results, being able finally to find how much does each of the factors affect the bidder on his decision. Whether the factors remain stable or have different weights according to the circumstances is also to be examined. A primary sample survey was created to evaluate the final questionnaire form; 21 questions were categorized in 12 categories investigating the factors affecting the bidder's decision. The questionnaire was anonymously filled out, while participating was completely volunteering. The type of questions used was multiple choice with one answer accepted and throughout the questionnaire clarity was the main goal, which is one of the most popular questionnaire issues. Answer-driven questions were also avoided, creating neutral and clear expressions. The questionnaire was available in two language versions (English and Greek), using the questionnaire developing software LimeSurvey, (www.limesurvey.org, 2007) and was hosted on a University of Patras server. The questionnaire is presented in Appendix A.

All 218 surveys were filled out between February and March 2007 by eBay users. The sample emanated from users that maintain accounts in various interest forums. Finally, for the statistical analysis of the questionnaire results was used the R-Project [15].

TABLE I
FACTORS' STATISTICAL MEASURES ACCORDING TO ITEM'S CONDITION.

Category	Mean	Std	Skewness	Kurtosis
Item Price				
K_1	2.624	0.6620	0.2050	-0.4144
K_2	3.234	0.6892	-0.4222	0.5459
K_3	3.569	0.6349	-1.2794	0.9465
Seller Feedback				
	3.023	1.0089	-0.6352	-0.7981
Item Image				
general	3.362	0.6935	-1.6184	2.5490
K_1	3.479	1.5488	-0.4451	-1.3740
K_2	4.561	0.9561	-2.3700	4.8722
K_3	4.706	0.8946	-3.1528	8.9813
Item Description				
general	4.280	0.9929	-1.6184	2.5490
K_1	3.688	1.3556	-0.6743	-0.8102
K_2	4.390	0.9205	-1.7233	2.8864
K_3	4.541	0.9261	-2.3723	5.3896
Communication				
	4.518	0.8102	-2.2330	6.0759
Time until auction ends				
	3.908	1.3305	-0.9194	0.4865
Prior bids (herd effect)				
	2.683	1.3563	0.1304	-1.2204

To evaluate the weight of each factor, every questionnaire participant was asked to rank the factors in decreasing order of importance. Furthermore, in order to discover whether or not more undiscovered factors affecting the the bidders' existence, the participants were also asked to and rank them among the others.

Another observed fact is that bidders change their stance on bidding depending on item's condition. For example, real images are strongly needed in cases of used items. In order to measure the changes in factors' weights a discrimination of 3 item condition categories was made:

K_1: new items
K_2: used items in excellent condition and
K_3: used items in good condition

V. Survey Findings

In Table I all the factors investigated are listed with statistical results for each one of them. Factor results are discriminated when needed in our three condition categories (K_1, K_2 and K_3) and mean, standard deviation, skewness, kurtosis are shown based on our questionnaire answers.

A glance at the factors results can lead us to some early conclusions. First of all, according to the majority of the studies, price mean increases as the item condition deteriorate. The same increase appears also in item image and item description with the largest difference between new and used item (slightly or heavily used). This strongly endorses the bidder's need for large images and description of the item. Whatever the item's condition is, when it is not new, bidder

has to be reassured that he knows what he is investing on. Concerning seller feedback, it is notable that there is no important disaggregation between highly feedback rated sellers (most ratings are over 95%) which might make a negative comment rating more usable for the bidders.

Essential in order to create a complete view of the factors' literature are the results of a question in which bidders were asked to rank the factors by importance. In Table I the results of this question are presented along with each factor's calculated weight. The sample of the survey was adequate to present a ranking between the factors. Nontrivial is the existence of another unidentified factor which always ranks last.

As expected, price is clearly the most important fact about bidding, while seller feedback is the secondimportant. Places three and four (the order is not statistically clarified) are occupied by item's image and description which could be also easily predicted. The surprise was that communication with seller during the auction ranked fifth or sixth along with payment method. This factor has not been examined in other research cases and seems to be quite important for the bidder. Time until auction ends and herd effect ranked seventh and eighth, while auction end day ranked ninth.

A. Answer's facts

The survey results lead us to hypothesis testing in order to present more concrete conclusions. Therefore, for each important observation we introduced a null hypothesis in order to accept or reject:

- H_1: the average discount in *item price* is the same in all 3 item categories.
- H_2: users do not care about *seller feedback* rating.
- H_3: one third of bids are placed during the last hour of the auctions (*time until auction ends* factor).
- H_4: users are not affected by prior bids (*prior bids* -herd effect factor).
- H_5: the number of images is the same in all 3 item categories (*item image* factor).
- H_6: *Item description* is equally important in all 3 item categories.
- H_7: users do not care about the length of the *item description*.
- H_8: users do not prefer using PayPal for their payments (*payment method* factor).
- H_9: credit card payment and bank transfer are not equally preferred (*payment method* factor).
- H_{10}: users do not care about the day the auction ends (*auction end day* factor).
- H_{11}: users do not care about *communication with seller* during the auction.

All factors' hypotheses were rejected. Accordingly, we evaluate each factor's importance, while significant remarks are presented:

a) Price: statistical analysis shows that buyers require different levels of discount according to the item condition. The negative sign of kurtosis for item categories K_2 and K_3 show that a deeper inquiry of item categories is required.

b) Seller feedback: the investigation of the factors shows that 70% of buyers require seller feedback rating of at least 95% to make a bid. The fact that very high reputation rating is required for buyers so as to bid might lead to the conclusion that negative comments will have a much more significant effect on buyers choice than the positive ones. Thus, a negative comment rating approach in seller's feedback might prove more appreciated by eBay users.

c) Item image: item image is concerned from all buyers as necessary on an on-line auction. It was also expected that the necessity of the image increases as the condition of the item deteriorates.

d) Item description: statistical analysis also shows that a small percentage of buyers (less than 8%) is not affected by the length and the level of detailed presentation in description, while most buyers seem increasingly interested as the item condition deteriorates. This seems to agree with the findings of Kauffman and Wood [8] (more information on item leads to higher prices).

e) Communication with seller during the auction: in communication things are clear, although a small percentage (less than 13,5%) is observed not being affected by this factor or slightly affected.

f) Payment Method: the payment method ranking was as expected. Most users seem to seek PayPal for their item e-payment, while second most popular method is credit card use. Bank transfer is way the third most popular method and personal cheque fourth which seems to serve very few.

g) Time until auction ends: according to the questionnaire answers, about 50% of the bids for an item are placed during the last hour of the auction, 25% are placed 1 to 3 hours before the auction ends, 12,5% are placed 3 to 12 hours before the auction ends etc. The findings show that "bid sniping" [14] is a strategy many users will choose to apply, whilst others won't tend to bid during the last three hours until their auctions end.

h) Prior Bids (herd effect): from the answers given we observe that eBay users are divided into two categories:

- in a small percentage (less than 18%) which is indifferent to this factor and
- in the majority (greater than 82%) of the users that take it under consideration. 57% of them seem to be decisively influenced by the herd effect.

Our findings here again agree with the conclusion of Kauffman's and Wood's [9] work about the prior bids in an auction.

i) Auction end day: about the day the auction ends, the larger percentage (not larger than 60%) remains indifferent by the day they will bid for an item, while the remaining percentage (not less than 40%) seems influenced. Differences in results may occur about this factor between studies as internet usage and weekend habits change from country to country.

k) Other factor(s): from the statistical analysis it is found that even if other factors affecting bidding exist, they fall short of importance on contrast to the others mentioned.

TABLE II
FACTORS' RANKINGS.

Ranking	Factor	Factor Weight
1	Item Price	0.8119
2	Seller Feedback	0.0640
3–4	Item Image	0.0294
	Item Description	0.0294
5–6	Communication	0.0215
	Payment Method	0.0215
7–8	Time (until auction ends)	0.0087
	Prior bids (herd effect)	0.0087
9	Auction end day	0.0043
10	Other factor	0.0006

VI. CONCLUSIONS AND FUTURE RESEARCH

In this paper, the factors affecting a possible buyer in his/her decision to bid in an electronic auction were thoroughly examined. The most important findings of our work are:

(a) the classification of factors depending on their importance,
(b) the analysis of each factor as well as the appearance of a new factor (communication with seller during the auction).

More specifically, the importance of communication between buyer and seller was evaluated for the first time. It was also clarified that the existence of item image is essential for the user, as well as the extent of the description of the item. Seller feedback rating could be improved as an eBay feature, projecting negative comments in percentage of total. It would also be interesting to embed the item's price category to eBay's feedback system. Simultaneously, it was observed that although most users watch the item that interests them in-3-days time before the auction expires, they wait for up to the last hour in order to bid for it. Moreover, statistical analysis of all factors showed an explicit and measurable differentiation depending on the category of product (age). In addition to that, a small portion of buyers presents neutrality and/or indifference for certain factors.

In future research we will examine the reliability of our findings based on actual data drawn with special software from eBay or other online auctions websites. Another main goal is to improve the efficiency of our survey based on our current answers. For that, an additional and improved survey may be important. Finally, important research interest presents the application of modern techniques of data mining for the configuration and analysis of potential different profiles of possible buyers.

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APPENDIX

A. Questions concerning the price of an item in auction.

1) How lower should be the price of a brand new item be comparing to the price of a natural shop in order for you to bid for it on ebay.com?
   a) About the same price as the natural shop. (0–10% lower price)
   b) 10%-30% cheaper.
   c) 30%-50% cheaper.
   d) At least 50% cheaper (half price or lower).
2) How lower should be the price of a used item in excellent condition be comparing to the price of a natural shop's brand new one in order for you to bid for it on ebay.com?
   a) About the same price as the natural shop. (0–10% lower price)
   b) 10%-30% cheaper.
   c) 30%-50% cheaper.
   d) At least 50% cheaper (half price or lower).
3) How lower should be the price of a used item in good condition be comparing to the price of a natural shop's brand new one in order for you to bid for it on ebay.com?

a) About the same price as the natural shop. (0–10% lower price)
b) 10%-30% cheaper.
c) 30%-50% cheaper.
d) At least 50% cheaper (half price or lower).

B. Questions concerning the time until the auction ends

4) In which exact time point during an auction would you bid for a product?
   a) Between 5 days and 24 hours until the auction ends.
   b) Between 24 and 12 hours until the auction ends.
   c) Between 12 and 3 hours until the auction ends.
   d) Between 3 and 1 hour until the auction ends.
   e) 1 hour or less until the auction ends.

C. Questions concerning the seller's reliability

5) Which is the least acceptable seller's feedback rating in order for you to bid for a product in an auction on ebay.com?
   a) Not less than 90%-95% positive feedback rating.
   b) Not less than 95%-98% positive feedback rating.
   c) Not less than 98%-100% positive feedback rating.
   d) I don't care

D. Questions concerning the influence of prior bids in an auction in ebay.com.

6) Please grade from 1 to 5 how important is for you the existence of prior bids from other possible buyers in an auction for a product in ebay.com:
   □1 □2 □3 □4 □5
7) Assume that there are 2 similar auctions of the same product with the same buying conditions. You have to decide on which one to bid. What should the adequate proportion between the prior bids be so as to be driven directly to bid in one of the auctions? (We assume that the prior bids are 10 in both the auctions) *Example: I would bid for the item that has at least 7 bids against 3 (meaning the one auction has 7 prior bids while the other has only 3, so I choose the first one)*
   a) 6–4
   b) 8–3
   c) 8–2
   d) 9–1
   e) 10–0

E. Questions concerning the influence of images during the auction.

8) How many images in the item description do you consider as necessary enough for you to bid during an auction?
   a) None. The image is not a necessity for me to bid for an item.
   b) 1 image is enough.
   c) 2 images, 1 in the short and 1 in the extended description of the item.
   d) More than 2 images of the item.
9) Depending on the item condition how important is the existence of an image during an auction on ebay.com?
   For a brand new item.
   □1 □2 □3 □4 □5
   For a used item in excellent condition.
   □1 □2 □3 □4 □5
   For a used item in good condition.
   □1 □2 □3 □4 □5

F. Questions concerning the item description

10) How much does a more detailed description of an item affect you in comparison to a shorter one during an auction in ebay.com?
   □1 □2 □3 □4 □5
11) Rate how much does a more detailed description of an item affect you in comparison to a shorter one during an auction in ebay.com depending on the item's condition:
   For a brand new item.
   □1 □2 □3 □4 □5
   For a used item in excellent condition.
   □1 □2 □3 □4 □5
   For a used item in good condition.
   □1 □2 □3 □4 □5

G. Questions concerning the Payment Method

12) Which is your preferred payment methods in an ebay.com auction?
   a) PayPal
   b) Credit Card
   c) Bank Deposit / Transfer
   d) Personal Cheque

H. Questions concerning the bidding day

13) During the non-working days (weekend-holidays) you more likely to bid on an item than the usual workdays?
   a) Not that I have observed.
   b) Maybe I little more like 0%-20% due to free time.
   c) During the holidays I use ebay.com 20%-50% more than the usual working days.
   d) I use Internet only on holidays so there is a 50% or more chance that I bid on an item these days than the usual working days.

I. Communication during the auction.

14) How important do you consider the communication (quick and comprehensive answers about the price, shipping cost, item condition etc) between you and the seller before you bid for an item on ebay.com?
   □1 □2 □3 □4 □5

J. Other factors.

15) Please describe any other factor not mentioned in current survey that could affect your choice for a bid in an auction on ebay.com

K. Importance ranking of factors examined.

16) Please rank the factors examined in the current survey according to each ones' importance. *(Please number each box in order of preference from 1 to 10)*
   - □ Item Price (including shipping costs).
   - □ Existence of one or more images in the description.
   - □ Time until the auction ends.
   - □ Positive seller rating.
   - □ Communication between buyer and seller.
   - □ Item description.
   - □ Payment method.
   - □ Bidding day.
   - □ Prior bids on an auction.
   - □ Other. (referring to question 15)