



An experimental study of reputation with heterogeneous goods

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ARTICLE INFO

Article history:

Received 30 July 2011

Received in revised form 24 October 2012

Accepted 28 October 2012

Available online 2 November 2012

JEL classification:

D02

D83

Keywords:

Laboratory experiment

Trust

Reputation

e-Commerce

Decision

Market

ABSTRACT

Reputation systems provide decision support for e-commerce. A shortcoming of existing systems is that all transactions are rated equally, and the impact of reputation systems for differently valued goods is not well understood. In an experiment, we study a heterogeneous good market. We find that the reputation system increases surplus by increasing transactions in the high value good. Allowing for heterogeneous goods reduces information, as buyers cannot determine whether the seller previously transacted in low/high value goods. We test a new system, which displays reputation separately for each good. We provide evidence that this additional information is utilized in decisions.

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1. Introduction

The growing popularity of e-commerce has increased the need for decision support systems that strengthen trust among strangers, reduce information asymmetries, and facilitate transactions when there is an opportunity to cheat [15,28,44].¹ Reputation systems have emerged to fill this role, and have been implemented in several e-commerce sites such as eBay and Amazon Marketplace. The different design aspects of reputation systems, such as the amount and type of information to display, play an important role in determining the success of organizations that conduct business online [35]. The design of these mechanisms has potentially important implications for individual decision-making and for a wide range of management activities, such as brand building, customer acquisition and retention and quality assurance [17]. Effective reputation systems that promote trust and encourage successful transactions will increase the prevalence of e-commerce activities, since Internet consumers' trust impacts the purchasing decision [25,34,36].

We contribute to the study of reputation systems through an experimental investigation of how markets function when heterogeneous goods are available to buyers. In practice, there is a substantial difference in value among goods in electronic marketplaces. The popular online electronic exchange site eBay, which holds 80% of the online auction market share, allows sellers to offer goods of widely varying values.² For example, with a search on eBay one can see an e-book for sale with a value of less than \$1.00, as well as a house for sale with a value above \$300,000. Evidence from eBay suggests that when goods of different values are available, sellers engage in strategic reputation building, selling many low value goods to build reputation and then defaulting on high value goods [4,8]. Yet there is limited understanding of the choices individuals make when faced with heterogeneous goods in an e-commerce market. This necessitates the development of a new framework for understanding reputation systems with heterogeneous goods, which will guide organizational decisions about which reputation systems to employ.

We conducted a laboratory experiment to study consumer-to-consumer transactions in a setting with heterogeneous goods. Laboratory experiments have been promoted as a valuable methodology in decision support systems (DSS) for understanding different market mechanisms and provide more control than data available in the field

Abbreviations: SP, Standard preference; MP, Medium preference; HP, High preference.

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¹ According to a press release by ComScore, a company that tracks the digital world, the popularity of e-commerce continues to increase rapidly. Black Friday (November 27) in 2009 saw \$595 million in online sales, an increase of 11% as compared to Black Friday 2008. During the 2009 holiday season, over \$10.57 billion dollars was spent online. http://www.comscore.com/Press_Events/Press_Releases/2009/11/Black_Friday_Boasts_595_Million_in_U.S._Online_Holiday_Spending_Up_11_Percent_Versus_Year_Ago.

² eBay Inc. reported approximately 647 million listings in the first quarter of 2008 and gross merchandise transaction volume of \$16 billion in the third quarter of 2012. Figures are cited from eBay's financial release, available at http://investor.ebay.com/financial_releases.cfm.

[26]. In our experiment, sellers choose to offer a high value or a low value good, buyers choose whether to purchase the good, sellers choose whether to send the good to the buyer, and in some treatments the reputation of the seller is automatically updated. We find that the market is less efficient when there is no reputation system because fewer high value goods are traded, but that efficiency is increased with a reputation system. Efficiency is defined as level of surplus that the participants of the market are able to extract relative to the total possible surplus. Successful transactions in high value goods are more profitable than transactions in low value goods, but traders are unable to take advantage of this when there is no reputation system.

The first reputation system we investigate is similar to that used in laboratory experiments with homogeneous goods. In a homogeneous good setting, this reputation system carries complete information about the seller's past behavior. We find that the reputation system increases efficiency, primarily by increasing successful transactions in high-valued goods and decreasing cheating behavior.

However, when heterogeneous goods are available, the information carried by the reputation system is reduced. Specifically, buyers cannot tell from the reputation system whether the seller previously transacted in high or low value goods. Therefore, we investigate a second reputation system that displays reputation separately for each type of good. Previous experimental work has ignored this issue; in fact, this question can only be addressed in a setting such as ours. We do not find a significant effect on efficiency as compared to the first reputation system. However, our results offer suggestive evidence that the additional information provided by this new system is used advantageously by buyers and sellers.

2. Material and methods

2.1. Background

Previous work has emphasized the necessity of trust and reputation in the context of e-commerce applications in business-to-business [1,46], business-to-consumer [6,23,38,45], and consumer-to-consumer interactions [43,50,52]. This research is relevant for organizations that facilitate trade among agents in consumer-to-consumer e-commerce, such as eBay, Amazon Marketplace, and others. This research is also applicable to business-to-consumer e-commerce where users purchase products and rate quality (see [35,17] for an overview of the role that feedback plays). Reputation systems have been recognized as a way to increase trust [7,37,42,51] signal information [41], reduce information asymmetry [14,48,50,54], and act as a collaborative sanctioning system [35,52].

Although previous experiments have studied the role of seller reputations with heterogeneous goods [11], all previous market experiments that have addressed reputation mechanisms explicitly employ a setting of homogeneous goods [7,18,19,47,48]. The general finding of related work is that the reputation system increases the number of successful transactions that take place, thereby unilaterally improving efficiency of the market. Many of these experiments analyze the value of various reputation mechanisms; however, this understanding may be limited in practical applicability because buyers and sellers may behave differently in the framework with heterogeneously valued goods.

Empirical evidence from eBay suggests that buyers and sellers behave differently when heterogeneous goods are available. In particular, sellers may engage in reputation building by selling many low value goods to increase reputation, and then selling high value goods and defaulting [4,8]. eBay's recent changes to the cost structure made the practice of arranging for false transactions in order to gain reputation even cheaper and more feasible [20]. Anecdotal evidence suggests that some users of eBay know that this type of behavior is occurring. For example, a participant in a focus group commented,

"For example I've seen people selling laptops with pretty high ratings and I go and read their feedback and the only thing they've sold is like clothes or very cheap goods, and they go for very high feedback" [30].

Diverse empirical findings have been reported for different types of goods, suggesting that different feedback systems must be designed to take such differences into account [39]. Empirical work has found that reputation matters in eBay auctions for several different types of homogeneous goods, such as computer processors and guitars [22,33]. Other work has found that reputation matters for heterogeneous goods, such as rare coins of varying qualities [41]. Our contribution is an experiment that allows us to control many factors that cannot be controlled in empirical work, such as quality aspects of the good and communication between the buyer and seller that can occur online. In our experiment, we systematically change the types of goods available on the value/price dimension only. While empirical work can compare quality in "collector" auctions, such as for rare coins, even very experienced buyers may not always be fully aware of the quality of the good, or the quality may be perceived differently by different buyers. The experiment is the best way to abstract from differences in knowledge about quality for heterogeneous goods, but simply using goods that have a different experimental dollar value that is commonly known. The unique benefit of approaching this problem using an experimental methodology allows us to directly compare the effect of different reputation systems on decision-making. Moreover, the careful comparison of different reputation systems has been advanced as an important area of interest in DSS research [40].

The reputation mechanisms used in most e-commerce sites do not account for the value of previous transactions, which are only available in the detailed reputation. For example, on eBay, buyers must click through several pages to read details about transactions to find their value, and this is time consuming. It has been suggested that buyers may not look at the detailed reputation on eBay [48]. Empirical work has shown that buyers pay more attention to feedback when buying expensive products and less attention when buying cheaper products on eBay [48]. In addition, buyers pay more attention to feedback incurred as a seller than as a buyer [53]. Therefore, it is important to investigate whether detailed feedback is a necessary aspect of an effective reputation system.

2.2. Experimental environment

The objective of this project is to investigate various reputation systems in a heterogeneous good setting. In the experiment, we consider a market with goods that are different on the value/price dimension. We also consider a case of buyer and seller transactions in which all individuals participate in both markets for high and low value goods.³ The payoffs are chosen to assure that a sufficient volume of trade occurs in each type of good. The setup does not allow for price-setting for consistency with previous literature [7]. The decision tree is displayed in Fig. 1.

In each period of our experiment, sellers are first asked whether they would like to offer for sale a high value or a low value item. Each seller is only allowed to offer one item. Then, buyers are shown a screen with each seller's offer and reputation score, and enter the market one by one to buy items (see Fig. 2 for a screenshot of a buying screen). The buyers enter in a random order as determined by the computer in each period. When buyers enter the market, they are given the choice to buy one available item from any human seller, or to buy an item from the computer (the computer item is lowest value and acts as an outside option in case the buyer does not want

³ Note that this special case would be likely to occur in the following example. If a seller was transacting in the same type of items but sold different quantities of each of them—for example, selling a set of 10 or 1000 miscellaneous postage stamps. Postage stamp collectors may choose to purchase the smaller set or the larger set, but all potential buyers would view both types of listings.

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