

Modeling Buyers in Competitive Electronic Marketplace Environments

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1 Abstract

In the absence of legal enforcement procedures for the participants of open electronic marketplaces, trust and reputation systems are central for resisting against threats from malicious agents. Such systems provide mechanisms for identifying the participants who disseminate unfair ratings. Reputation systems [4] are a particularly effective approach for buyers to evaluate sellers. In such systems, if a certain buyer does not have adequate personal experience with some candidate sellers, it will disseminate queries to other buyers (also called advisers) to inquire information about the sellers. Based on the reporting of seller information provided by the advisers, the buyer can then model the reputation of the sellers. However, in open environments, advisers may untruthfully report information about seller reputation because of their internal dispositions being deceitful or malicious. Also, it is possible that some of the honest participants are victimized as a consequence of the poor judgement of these systems.

This paper consists of two main parts: In the first section, we propose a Prob-Cog model [2, 3], the two-layer filtering algorithm, that probabilistically and cognitively elicits the behavioural characteristics of the participating agents in an e-marketplace. We argue that the notion of *unfairness* does not exclusively refer to deception but can also imply differences in dispositions. The proposed filtering approach aims to go beyond the inflexible judgements on the quality of participants and instead allows the human dispositions that we call optimism, pessimism and realism to be incorporated into our trustworthiness evaluations. The Prob-Cog model consists of two layers. In the first layer, buyers take a probabilistic approach and narrow a circle of neighbours by expelling those with significant deceptive patterns, as well as those with an inadequate number of experiences. The basis of the second layer provides mechanisms to cognitively derive the actual intentions of the surviving agents of the previous layer. Here, buyers conduct additional evaluations and objectively estimate the similarity degree of advisers through a multi-criterion rating model. Thereafter, they classify their behavioural characteristics based upon their own attitudes. The proposed filtering model articulates that buyers could have different credibility degrees for the same advisers.

In the second part of the paper, we discuss how participants should determine their reporting strategy in a competitive marketplaces where the number of high quality products provided by good selling agents is limited. Different approaches [2, 6, 7] have been proposed to and the number of high quality products provided by good sellers is unlimited. And, a successful business transaction of one buyer would not result in a loss for other buyers. However, in a competitive marketplace, buyers may have to be concerned

about the possibility of losing the opportunity to do business with the good sellers if the buyers provide truthful information about sellers, due to the competition from other buyers.

In this paper, we proposed a trust-oriented mechanism for buyers in competitive e-marketplaces to strategically determine their reporting behaviours, regardless of their dispositions, but rather based on the trustworthiness of their advisers as well as the future opportunity of reliance on the advisers information about seller reputation [5]. More specifically, in the trust-oriented seller reporting component of our trust-oriented mechanism, buyers are engaged in variable-length iterated Prisoners Dilemma games. Buyers acquire reputation information regarding certain sellers from advisers and evaluate the quality of the received information through modeling advisers' trustworthiness using the Prob-Cog model as well as their level of willingness. Based on the modeling results, buyers predict the expected utility when taking different reporting behaviours and choose the one that maximizes the utility. Afterwards, in the trust-oriented seller selection component of our trust-oriented mechanism, buyers aggregate seller reputation information reported by advisers and the buyers own personal experience with the sellers, to derive the trustworthiness of the sellers. Based on the modeled trustworthiness levels of sellers, buyers filter out the sellers whose trustworthiness values are not high enough. Then, they invite the other sellers to join their trust-aware multi-attribute First-score Sealed Bid Procurement auctions, by announcing their QoS preferences on products to the sellers. After receiving bids from the sellers, the buyers will come up with the scores of the sellers based on a scoring function [1]. The seller whose score is the highest will be the winning seller.

Experimental results confirm that competitive marketplaces operating with our mechanism lead to better profit for buyers and create incentives for seller honesty.

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