http://ansinet.com/itj

ITJ

ISSN 1812-5638

INFORMATION TECHNOLOGY JOURNAL

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Information Technology Journal 10 (12): 2329-2335, 2011
ISSN 1812-5638 / DOI: 10.3923/itj.2011.2329.2335

Measuring Feedback Credibility by Customer Value in C2C Trust Model

[1]Yuansheng Zhong, [1,2]Jianying Xiong and [2]Leiyue Yao
[1]School of Information Management, Jiangxi University of Finance and Economic, China
[2]Jiangxi Bluesky University, China

Abstract: Trust is emerging as a key element of success in C2C electronic trade. Rater's credibility which is used to avoid false feedbacks is the most important factor in feedback-based trust system. A reputation and RFM mixed model to compute rater's credibility is proposed in this study. Comparing the cost of trust fraud and the evolution cost of rater's credibility by simulation analysis, the mixed model is suitable to resist the low cost fraud, such as sign some accounts to buy his own goods and then give high feedback value. And empirical analysis has verified that the trust mechanism can reduce failure transaction ratio superior to single reputation.

Key words: Feedback credibility, trust, reputation, RFM, C2C

INTRODUCTION

C2C e-commerce is undoubtedly the most popular among the diverse business attribute to its rapidly growing revenue in China. Trust is a key typical governance mechanism employed to safeguard business transaction and mitigated the information asymmetry between buyers and sellers (Josang *et al*., 2007; Resnick *et al*., 2000). Various reputation management systems have been developed for C2C e-commerce to help users estimate the trustworthiness of unknown buyers and sellers (Gahill *et al*., 2003). Reputation values are referred to the aggregation of recommendation from other entities. It has been able to generate trust between the buyer and seller in C2C platform (Ba and Pavlou, 2002). Trust and reputation scores can be computed based on own experience, on second hand referrals, or on a combination of both. Online reputation system is typically based on public information in order to reflect the community's opinion in general (Josang and Lo-Presti, 2004). The simple form of computing reputation scores is simply to sum the number of positive ratings and negative ratings separately and to keep a total score as the positive score minus the negative score. This is the principle used in eBay's reputation forum (Li and Liu, 2007; Resnick and Zeckhaser, 2002) and Taobao's reputation (Li and Liu, 2007). A slightly more advanced scheme (Schneider *et al*., 2002) is to compute the reputation score as average of all ratings and this principle is used in the reputation systems of numerous commercial web sites, such as Epinions and Amazon. Advanced models in this category compute a weighted average of all the ratings (Yu *et al*., 2004), where the rating weight can be determined by factors such as rater's reputation, age of the rating, distance between rating and current score, etc. The method weighted average by rater's reputation which is a distinction of rater's credibility believed that who has a higher reputation value will give more credible feedback. It is obviously a reasonable supposition. Generally, seller will receive a positive feedback for his good service or goods and buyer will receive a positive feedback for impartial feedback value to seller owing to the third-party payment assurance in China.

So the reputation value for each buyer will have little significance to compute the weight of seller's reputation. Very little studies measure credibility of the feedback from customer value and customer loyalty in the e-community. It is suggested that the buyer who is loyal to the community or has more customer value will provide more objective, credible, valuable feedback. Some studies (Hong and Cho, 2011; Sirdeshmukh *et al*., 2002; Harris and Goode, 2004; Singh and Sirdeshmukh, 2000) suggest there are a relationship among trust, customer value, customer loyalty. An empirical study of Hong and Cho (2011) suggested that consumers willingly buy from unknown sellers within an e-marketplace, despite the apparent risk, since they trust the institutional mechanisms furnished by the relatively well-known intermediary. Consumer's trust and loyalty in e-marketplace not only affect their trust in the other but also influence the way consumers make online purchase. Sirdeshmukh *et al*. (2002) built mechanisms that convert consumer trust into value and loyalty in relational exchanges by understanding the behavior of service providers. The contemporary understanding of trust dynamics to provide theoretical and managerial insights has been extended, including value as a mediator of the trust-loyalty effect. Harris and Goode (2004) tested and verified that positions trust is a

Corresponding Author: Jianying Xiong, School of Information Management, Jiangxi University of Finance and Economic, China

pivotal driver of loyalty through both synthesizing and building on existing research into loyalty, trust, satisfaction, value and service quality. An empirical study of Singh and Sirdeshmukh (2000) specified how trust mechanisms to affect satisfaction individual encounters and long-term loyalty. So it also indicated that the buyer who rich of customer value and loyal to the e-marketplace should have direct perceived value, satisfaction and service quality really, they are more responsible to provide a credible feedback and their feedback will be more impartial, objective and valuable. Li *et al.* (2010) measured customer value and loyalty by RFM (Recency, Frequency, Monetary) model and use it to identify the influential reviewers for word-of-mouth marketing. The review-rating mechanism of measure feedback credibility may be lead to bias due to reciprocation of positive ratings and retaliation of negative ratings. The RFM characteristic of rater indicated the customer value and loyalty to the e-marketplace. It is likely that those raters who have high RFM value will provide more impartial, objective and valuable feedback.

RELATED WORK

Trust and reputation: Trust is expectancy that the behaviors of people (or objects of trust evaluation) will follow a predetermined manner (Ammeter *et al.*, 2004). Trust is described as "central to all transactions" between actors in economics and strengthens the motivations of people to do transactions (Dasgupta, 2000). Dunn *et al.* (2008) indicated that trust mechanism is an important and effective component of our purchase decision, although, we are not familiar with the product. Reputation is what is generally said or believed about a person's or thing's character or standing (Josang *et al.*, 2007). Reputation values are referred to the behavior of the different entities in the network. These values could be used as inputs in order to determine trust values (Lopez *et al.*, 2010). Most trust models based on reputation have been proposed by researches considering the diverse scenarios of distribution system, P2P networks, agent based systems and pervasive computing, etc. (Zacharia *et al.*, 2000; Malaga, 2001; Kamvar *et al.*, 2003; Xiong and Liu, 2004). The network architectures of reputation system can be divided into centralized and distributed and reputation computation including simple summation or average of ratings, Bayesian systems, discrete trust models, belief models, Fuzzy models, etc. (Josang *et al.*, 2007).

Feedback credibility: Trust between individuals depends on the recommendation of other individuals and credibility of referrer determines the trust level in the social network. The feedback from those raters with higher credibility should be weighted more than those with lower credibility should be weighted more than those with lower credibility. Zacharia *et al.* (2000) proposed SPORAS model through using rater's reputation as weight of presenter's trust to improve the online reputation. Malaga (2001) proposed a conceptual model to compute the user's feedback weight by a function of trust value for the rater. There are some researches on feedback credibility in P2P environment. Eigentrust model accumulate the number of satisfaction and dissatisfaction, use the ratio of them as local credibility, then weighted local credibility average of all the rater by recursively (Kamvar *et al.*, 2003). Xiong and Liu (2004) proposed reputation-based trust model named PeerTrust for the P2P online community. In PeerTrust model, the credibility of feedback computing can be divided into PeerTrust-TVM and PeerTrust-PSM. The PeerTrust-TVM is similar to Eigentrust model which use the trust value of a peer recursively as its credibility. PeerTrust-PSM uses the root-mean-square or standard deviation of the two feedback vectors to compute the feedback similarity and given more weight to similar raters. In a word, the feedback credibility can be computed by reputation-based and similarity-based solutions. Although, the credibility based on similarity evaluation is more reasonable than credibility based on peer's reputation. Similarity of the overall calculation for the feedback usually leads to higher computational cost as a basis for the credibility. So, it is difficult been applied in the global reputation model.

It is obviously that the feedback given by a trustable rater normally has higher impacts. On the other hand, the feedback of an influencer should be trusted by more people. Due to these features, the trust score is a clear and appropriate pointer to potential nodes. In present research, we use customer value as an indicator to measure the credibility of rater and his feedback.

RFM: Hughes (2005) proposed the RFM model to measure the values of customers for enterprises. With RFM analysis, firms could discover the potential and valuable customers easily by observing their past behaviors. RFM analysis has been used in direct marketing for several decades (Baier *et al.*, 2002). The RFM identifies customer behavior characteristics by three variables. Recency refers to the interval time of the latest consuming and present; Frequency refers to the number of transactions in a particular period; Monetary refers to consumption money amount in a particular period.

TRUST MODEL

Trust value calculation: Generally, feedback given by a higher reputation rater is more trustable. The RFM

characteristic of rater indicated the customer value and loyalty to the e-marketplace. The relationship among trust, customer value and customer loyalty has been proved by empirical study. The trust-loyalty effect to a mediator also affects satisfaction with transaction. Customer value and loyalty can be measured by RFM model. The RFM characteristic of rater indicated the customer value and loyalty to the e-marketplace. It is likely that buyer who has high RFM value is rich of customer value and loyal to the e-marketplace, will provide more impartial, objective, valuable feedback.

The proposed model is based on the use of buyer's trading and the obtained feedbacks to compute buyer's weighted RFM score and buyer's average reputation. Then compute ratings of sellers by weighted average of the credibility of each buyer. Figure 1 illustrates the proposed procedure in this study.

The trust value of seller u is computed by weighted average of each rater's credibility.

$$T(u)=\sum_{i=1}^{I(u)}\left(f(u,i)\times\frac{Cr(b(u,i))}{\sum_{i=1}^{I(u)}Cr(b(u,i))}\right) \text{ if } Cr(b(u,i))>a \qquad (1)$$

where, T(u) is trust value of seller u, I(u) is total obtained feedbacks of seller u, f(u,i) is the feedback received in the ith transaction, Cr(v) is the credibility of buyer v. b(u,i) is the buyer who rate seller u in the ith transaction a is the threshold of credibility value, if Cr(v) is lower than a, the rating will be eliminated.

Most research believed credibility is related to the reputation of rater or feedback similarity. Although credibility based on similarity evaluation is more reasonable, it is difficult been applied in the global reputation model for high computational cost. In this study, the credibility is decided by buyer's reputation and customer value. The credibility of buyer i is positive correlation with his reputation and customer value. Credibility with rang 0 to 1 is denoted as follow:

$$Cr(i)=RFM(i)\times R(i) \qquad (2)$$

where, RFM(i) is normalization value of RFM score, R(i) is normalization value of buyer's reputation. Both the value is ranged from 0 to 1, so the seller's trust value is from 0 to 1. The seller's trust can be denoted as follow:

$$T(u)=\sum_{i=1}^{I(u)}\left(f(u,i)\times\frac{RFM(b(u,i))\times R(b(u,i))}{\sum_{i=1}^{I(u)}RFM(b(u,i))\times R(b(u,i))}\right) \qquad (3)$$

Buyer's reputation: The members of the online auctions community are not equivalent as in P2P e-commerce environment. That is to say, the buying (or use) an selling (or provider) behavior belongs to different role. So the member's reputation is distinguished between as a buyer or as a seller. The buyer's reputation used to compute the feedback credibility provided by buyer is computed as follow:

$$R(i)=\frac{1}{n}\sum f_j \qquad (4)$$

where, R(i) is the reputation of buyer, f_j is the feedback provided by sellers when complete a transaction. n is the transaction num.

RFM measure: The RFM model was initially proposed to measure the values of customers for enterprises (Hughes, 2005). Classic RFM implementation ranks each customer on valuable parameters against all the other customers and creates an RFM score for each customer. In this research, we modify the RFM model to evaluate the feedback credibility of the raters. The RFM score is measured in the following way:

- Denote r_i, f_i, m_i as the Recency, Frequency and Monetary value of buyer i
- Let $C_R(i)$, $C_F(i)$, $C_M(i)$ be the score of r_i, f_i, m_i

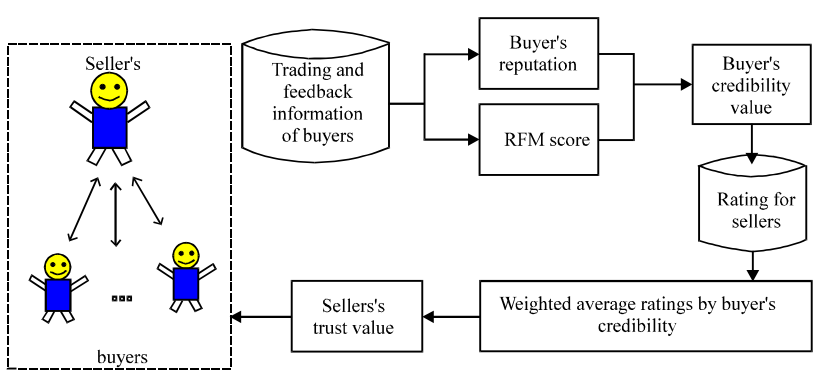

Fig. 1: System concept and produce

- Set empirical average value R_A, F_A, M_A of recency, Frequency and Monetary as the boundary values for classifying the customer set
- Standardize r_i for higher recency values indicates lower customer values

In this research, the "Recency" of a typical rater is interpreted as the time range between the current date and the latest feedback. For a rater i, the Recency value r_i is explicitly formulated as:

$$r_i = C - l_i \tag{5}$$

where, l_i is the last feedback's date of rater i and C is the current date. Std is standardized value.

$$Std_{r_i} = \frac{r_{max} - r_i}{r_{max} - R_A} \tag{6}$$

- Divide customer set equally into five subsets with Recency, Frequency, Monetary and assign Recency score, Frequency score, Monetary score as follow:

$$C_R(i) = \begin{cases} 1, & Std_{r_i} < 0.25 \\ 2, & 0.25 \le Std_{r_i} < 0.5 \\ 3, & 0.5 \le Std_{r_i} < 0.75 \\ 4, & 0.75 \le Std_{r_i} < 1 \\ 5, & Std_{r_i} \ge 1 \end{cases} \quad C_F(i) = \begin{cases} 1, & f_i < 0.25 \cdot F_A \\ 2, & 0.25 \cdot F_A \le f_i < 0.5 \cdot F_A \\ 3, & 0.5 \cdot F_A \le f_i < 0.75 \cdot F_A \\ 4, & 0.75 \cdot F_A \le f_i < F_A \\ 5, & f_i \ge F_A \end{cases} \tag{7}$$

$$C_M(i) = \begin{cases} 1, & m_i < 0.25 \cdot M_A \\ 2, & 0.25 \cdot M_A \le m_i < 0.5 \cdot M_A \\ 3, & 0.5 \cdot M_A \le m_i < 0.75 \cdot M_A \\ 4, & 0.75 \cdot M_A \le m_i < M_A \\ 5, & m_i \ge M_A \end{cases}$$

Compute the RFM score: The value of RFM score S is computed by weighed average of variables and RFM (i) is normalized value of S (i):

$$S(i) = w_R C_R(i) + w_F C_F(i) + w_M C_M(i) \tag{8}$$

$$RFM(i) = \frac{1}{5}(w_R C_R(i) + w_F C_F(i) + w_M C_M(i)) \tag{9}$$

where, w_R, w_F, w_M is the weight of each variable and C_R, C_F, C_M are scores of each variable.

Table 1: Matrix of group decision making

	R	F	M
R	0.99	0.70	0.46
F	1.41	1.00	0.85
M	2.19	1.18	1.00

The weight of recency, frequency, monetary can be initialized. In this study it is obtained by filling the questionnaire and using Analytic Hierarchy Process (AHP). The matrix of group decision is as Table 1. The consistency index CR<0.1 that indicated that the decision can be accepted. The weights of R-F-M are as follow: $w_R = 0.22$, $w_F = 0.34$, $w_M = 0.46$. Monetary has the maximum weight value that indicated an importance to influence the customer value (Table 1).

EXPERIMENTS

Simulation analysis: In theory, higher trust values imply the trade is more responsible and trustworthy. Seller's high trust values also indicate the capability of providing a good quantity of product or service. However, they are much trust fraud behavior. The reputation based feedback credibility encounter much fraud with lower cost. It is supposed that a normal seller with a steady trust value should trade with various buyers. There are three simulations to explain rater's credibility computed by RFM and Reputation based (RFM and Rep-based) is more superiority than reputation based (Rep-based). Because of the difficult simulation in Recency factor, we only consider the Monetary and Frequency variables in simulations.

Evolution cost: If maximum value of Monetary and Frequency are initialized, the buyer can obtain the high credibility easily in Rep-based model as Fig. 2 in high positive feedback bias environment, just like eBay (Resnick and Zeckhaser, 2002). Even has the highest credibility at first and then descend little after a great deal of trading. Similar to eBay and Taobao all have high positive feedback to buyers (Li and Liu, 2007). However, the credibility of rater is increased step by step in RFM and Rep-based, it is more reasonable to measure the credibility of members in reality.

Monetary and frequency cost: We set the maximum Monetary is 10000 and simulate 200 transactions to compute the monetary cost if a rater obtain credibility value 1. The Rep-based feedback credibility computing doesn't consider the monetary factor, so the rater can obtain a high credibility with a nearly 0 monetary cost. However, the cost of RFM and Rep-based model is much high than reputation based model Fig. 3.

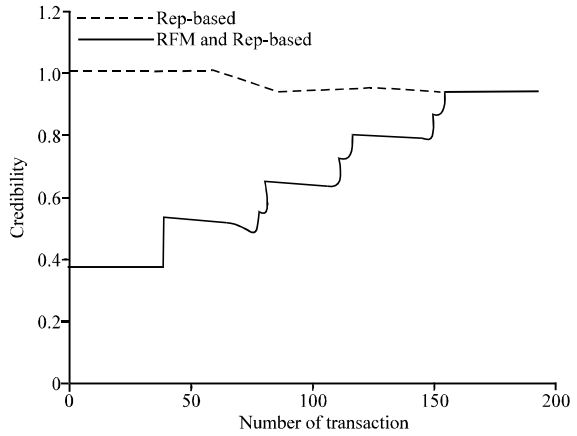

Fig. 2: Description of evolution cost

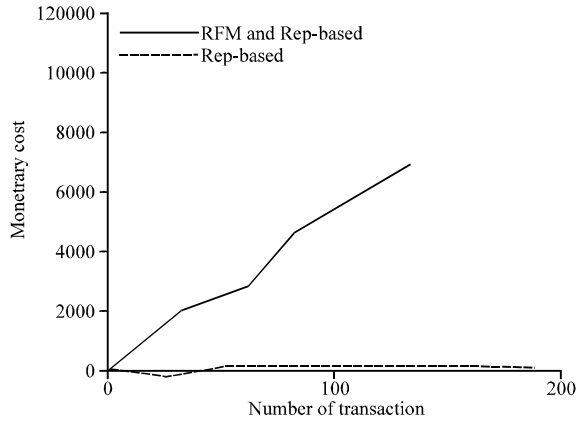

Fig. 3: Description of Monetary cost

Similarity, Rep-based consider the average feedback obtained by buyers instead of number of transactions, so a high credibility can be obtained with few transactions in Rep-based.

Trust fluctuating: Generally, buyer will receive a positive feedback for his payment or impartial feedback value to seller. Buyers always pay in time owing to the third-party assurance. So a normal bssuyer always has high reputation for his payment. The buyer's reputation is random between 0.9 and 1 in this study. It is suggested that sellers sell goods to various customer. If a seller only obtain the feedback focus on new customer with low RFM score, it is possible that he has got a high trust value by a low cost fraud or his trust is not accepted by most of customer. We simulate a normal seller selling goods to various buyers in Fig. 4a, the average trust, Rep-based trust and RFM and Rep-based trust almost have a same decrease of trust with increase of negative feedback. But if sellers only obtain high trust value by feedback from low RFM score customer, when transacting with various buyers, as the Fig. 4b the sellers' trust will decrease more sharply in RFM and Rep with the increase of negative feedback. So it is indicted that the feedback credibility based on RFM and Rep can resist the fraud with low cost in high positive rating environment.

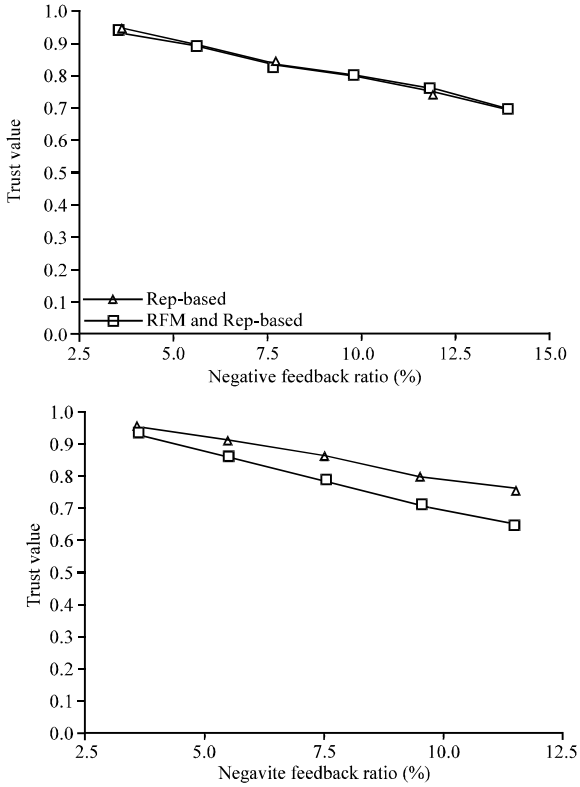

Fig. 4(a-b): Trust fluctuating with negative feedback in two conditions. a :Transacting with various buyer, b: after get high trust only new buyers

Table 2: Related data description

Data discription	No.	Mean	Min	Max	SD
Buyer's reputation	1036	0.97	0	1	0.169
Recency	1036	55.18	12	160	38.13
Frequency	1036	11.54	1	509	27.12
Monetary	1036	666.08	4.5	32830	2214.12
Seller's feedback number	203	78.37	46	150	26.27
Feedback received by seller	15986	0.995	-1	1	0.079

Empirical analysis: All the data is from the Taobao online auction website which is famous in China. About 118118 transactions and related feedbacks refer to 1036 buyers were collected in half a year. 15986 feedbacks received by 203 sellers who transacted with these buyers were filtered. The number of these sellers feedback is 50 to 150 aims to compute the trust of seller. The basic information of data is as Table 2.

There is often a positive bias when ratings are provided. Resnick and Zeckhaser (2002) found the eBay,

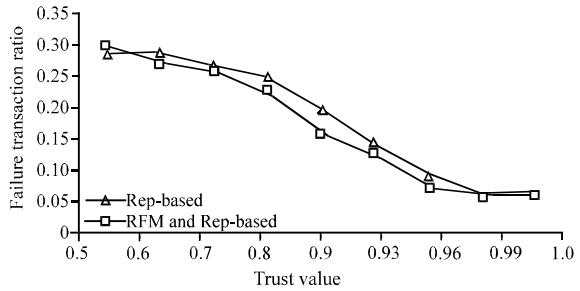

Fig. 5: Failure transactions ration with different trust threshold value

only 0.6% of all the ratings provided by buyers and only 1.6% of all the ratings provided by buyers were negative, which seems too low to reflect reality. We also have found that only 0.15% of all the ratings provided by buyers are negative in Taobao. Because of positive rating bias, we filter the buyer's initiative feedback and system default positive feedback and change the non-initiative positive feedback to neural value. Use these ratings to compute the trust value by Rep-based and RFM and Rep-based model. In order to test the efficiency of two models, an index is denoted as the ratio of failure transactions with all transactions. Failure transaction includes unsuccessful transaction and the non-positive feedback transactions which can be extracted from transaction information and feedback information. There are about 11.04% positive feedback is system default positive feedback and about 15.75% transactions have no feedback. We consider it is suitable to set these feedbacks as neutral but not positive or eliminated will reflect the reality better in the experiment. 1558 transactions were extracted in one month, 246 failure transaction and 33 non-positive feedback transactions are filtered. As the Fig. 5, both the two trust computed solutions have negative correlation with failure transactions ratio, it is indicted that improve the trust threshold value can reduce the failure transaction ratio in actual transaction experiment and the RFM-based model is slightly superior to Rep-based feedback credibility model.

CONCLUSION

Although, the advancement of IT technology and the internet reduces the cost of marketing behaviors, the "uncertainty" problem still exists. It is obviously that the feedback given by a trustable rater normally has higher impacts and should be trusted by more people. Most research shows that feedback credibility is always measured by rater's reputation and rating similarity. The RFM characteristic of rater indicated the customer value and loyalty to the e-marketplace. It is likely that those raters who have high RFM value will provide more impartial, objective, valuable feedback. We have presented a RFM and Rep rater's feedback credibility computing method and build the transaction-based feedback trust model. We evaluated the model by simulative experiment and actual data from Taobao. The results show that the RFM and Rep model will improve the trust fraud cost and suitable to resist the low cost fraud, such as sign some accounts to buy his own goods and then give high feedback value. From data collected from Taobao, if change the non-initiative positive feedback to neutral, the efficient of both model to reduce failure transaction ratio is been verified and RFM and Rep-based is slightly superior to the Rep-based. May be the obvious method for avoiding positive bias can consist of providing anonymous ratings and the trust value is more effective to regulate the transaction.

ACKNOWLEDGMENT

Present study was funded by a research grant from the department of education, NO.GJJ10019 and Soft Science Project from Science and Technology Agency of Jiangxi Province.

REFERENCES

Ammeter, A.P., C. Douglas, G.R. Ferris and H. Gokab, 2004. A social relationship conceptualization of trust and accountability in organization. Hum. Resour. Manage. Rev., 14: 47-65.

Ba, S. and P.A. Pavlou, 2002. Evidence of the effect of trust building technology in electronic markets: Price preminums and buyer behavior. MIS Q., 26: 243-268.

Baier, M., K.M. Ruf and G. Chakraborty, 2002. Contemporary Database Marketing: Concepts and Applications. Racom Communications, Evanston, IL., USA., ISBN-13: 9780970451514, Pages 320.

Dasgupta, P., 2000. Trust as a Commodity. In: Trust: Making and Breaking Cooperative Relations, Gambetta, D. (Ed.). Blackwell Publishing Co., Oxford, UK., pp: 49-72.

Dunn, J., B. Gu and A.B. Whinston, 2008. Do online reviews matter?-An empirical investigation of panel data. Decis. Support Syst., 45: 1007-1016.

Gahill, V., E. Gray and J.M. Seigneur, C.D. Jensen and Y. Chen *et al*., 2003. Using trust for secure collaboration in uncertain environments. IEEE Pervasive Comput. Mag., 2: 52-61.

Harris, L.C. and M.M.H. Goode, 2004. The four levels of loyalty and the pivotal role of trust: A study of online service dynamics. J. Retailing, 80: 139-158.

Hong, I.B. and H. Cho, 2011. The impact of consumer trust on attitudinal loyalty and purchase intentions in B2C e-marketplaces: Intermediary trust vs. seller trust. Int. J. Inform. Manage., (In Press).

Hughes, A., 2005. Strategic Database Marketing: The Masterplan for Starting and Managing a Profitable, Customer-Based Marketing Program. 3rd Edn., McGraw-Hill Professional, New York, USA. ISBN-13: 978-0071457507.

Josang, A. and S. Lo-Presti, 2004. Analysing the relationship between risk and trust. Proceedings of the 2nd International Conference on Trust Management, March 29-April 1, Oxford, UK., pp: 135-145.

Josang, A., R. Ismail and C. Boyd, 2007. A survey of trust and reputation systems for online service provision. Decision Support Syst., 43: 618-644.

Kamvar, S.D., M. T. Schlosser and H. Garcia-Molina, 2003. The eigentrust algorithm for reputation management in p2p networks. Proceedings of the 12th International Conference on World Wide Web, Budapest, Hungary, May 20-24, ACM Press, New York, USA., pp: 640-651.

Li, Q. and Z. Liu, 2007. Research on Chinese C2C E-business institutional trust mechanism: Case study on Taobao and Ebay(cn). Proceedings of the International Conference on Wireless Communications, Sept. 21-25, Shanghai, China, pp: 3787-3790.

Li, Y.M. C.H. Lin and C.Y. Lai, 2010. Identifying influential reviewers for word-of-mouth marketing. Electron. Commerce Res. Appl., 9: 294-304.

Lopez, J., R. Roman, I. Agudo and C. Fernandez-Gago, 2010. Trust management systems for wireless sensor networks: Best practices. Comput. Commun., 33: 1086-1093.

Malaga, R.A., 2001. Web-based reputation management system: Problems and suggested solutions. Electron. Commerce Res., 1: 403-417.

Resnick, P., K. Kuwabara and R. Zeckhauser, 2000. Reputation system. Commun. ACM., 43: 45-58.

Resnick, P. and R. Zeckhaser, 2002. Trust Among Strangers in Internet Transactions: Empirical Analysis of eBay's Reputation System. In: The Economics of the Internet and E-Commerce, Baye, M.R. (Ed.). Vol. 11. Emerald Group Publishing, UK., ISBN-13: 978-0762309719, pp: 127-157.

Schneider, J., G. Kortuem, J. Jager, S. Fickas and Z. Segall, 2002. Disseminating trust information in wearable communities. Personal Ubiquitous Comput., 4: 245-248.

Singh, J. and D. Sirdeshmukh, 2000. Agency and trust mechanisms in consumer satisfaction and loyalty judgments. J. Acad. Marketing Sci., 28: 150-167.

Sirdeshmukh, D., J. Singh and B. Sabol, 2002. Consumer trust, value and loyalty in relational exchanges. J. Marketing, 66: 15-37.

Xiong, L. and L. Liu, 2004. PeerTrust: Supporting reputation-based trust for peer-to-peer electronic communities. IEEE Trans. Knowledge Data Eng., 16: 843-857.

Yu, B., M.P. Singh and K. Sycara, 2004. Developing trust in large-scale peer-to-peer systems. Proceedings of the IEEE 1st Symposium on Multi-Agent Security and Survivability, Aug. 30-31, IEEE Xplore Press, pp: 1-10.

Zacharia, G., A. Moukas and P. Maes, 2000. Collaborative reputation mechanisms for electronic marketplaces. Decis. Support Syst., 29: 371-388.