Developing a Model of Social Relation Support for Online Reputation Systems

Fereshteh Ghazizadeh Ehsaei, Ab. Razak Che Hussin, and Mohammadali Kianian

Abstract—In an online environment, the aim of reputation systems is to let parties rate each other and to help consumers in deciding whether or not to transact with a given party. In current reputation systems for e-commerce, users have to trust unreliable information sources and anonymous people. As a result, users are not only hesitant to trust online seller but also reputation systems. Therefore, there is a need to improve current reputation systems by allowing users to make buying decision based on reliable source of information. This paper proposes a new approach of sharing knowledge and experience in reputation systems by utilizing social interactions. This study examines the potentials of integrating social relations information in reputation systems by proposing a model of acceptance of feedbacks in reputation systems. This can assist users to access trustworthy information sources by knowing the experience and feedback from people within their social communities. Through this approach, feedback will be filtered and presented based on evaluation of three factors. They are homophily, tie strength and source credibility based on relations between submitter and receiver of feedback to increase effectiveness of reputation systems.

Index Terms—E-commerce, trust, reputation systems, social networks, online.

I. INTRODUCTION

E-commerce or electronic commerce is one of the most important application of internet business models in the modern international business today. E-commerce has formed a significant part of our economic life. In the e-commerce environment, which doesn't require the physical presence of the participants, there is high level of 'uncertainty' regarding the reliability of the services, products or providers. Thus the decision to whom to trust and to whom to engage in a transaction becomes more difficult and falls on shoulders of individuals. E-commerce has changed the traditional mode of trade; more and more people began to use the Internet for shopping. Meanwhile, there are "information overload" as evident in e-commerce. Consumers have to spend more and more time to browse the web pages in order to find the proper online store and products [1]. In such a risky environment with overloaded information, it becomes crucial to help customers to making an easy and proper decision by establishing mechanisms that

facilitate evaluation of available information on different product and sellers available online.

One solution for the uncertainty that exists in e-commerce transactions is using reputation systems to assist consumers in making decision to distinguish between the low quality and high quality products or e-sellers [2]. Both practitioners and academic researchers in e-commerce have attempted diverse strategies to promote online trust; one strategy is developing reputation systems as a mechanism for collecting and distributing feedback information such as comments, reviews and ratings regarding the e-sellers or products. This mechanism is also refereed as "online word of mouth"[3]. A reputation system collects, distributes and aggregates feedback about participants' past behaviour. This system help people decide whom to trust, encourage trustworthy behaviour and influence future buyers that may base their buying decision on the past history [4]. Reputation systems are digitized word-of-mouth networks that allow individuals to rate, rank or provide feedback with regard to their online experiences for the benefit of others [3], [5].

There are a number of online reputation systems which exist in Consumer to Consumer (C2C) e-commerce such as eBay.com or Amazon.com. However most of B2C and B2B sites don't provide users with feedback information. There are some centralized services though, which offer store ratings and reviews to their users, such as Bizrate.com or Resellerrating.com. On eBay for example, for each transaction, buyers and sellers can choose to rate each other by leaving feedback. In eBay, feedback from buyers are categorized as positive (1), neutral (0), or negative (-1) plus a short comment. The system aggregates the reviews of each user by summing all of his/her received ratings, and highlight the results on the user's profile page. In eBay, the feedback score is one of the most important information of a feedback profile. It's the number in parentheses next to a member's user ID. These ratings are used to determine feedback scores which is representative of user's negative or positive reputation.

Research on reputation systems has shown that these systems can potentially play an important role in e-commerce as a trust building mechanism being used by consumers and as an effective tool for marketing purposes for e-sellers [6]. Although the trend for reputation system is growing, they still face many challenges such as how users evaluate the trustworthiness of feedback in the systems and the effectiveness of the systems in the process of decision

making for online shopping [7].

II. TRUST TRANSITIVITY AND REPUTATION SYSTEMS

Reputation system's performance is based on two main concepts; reputation and trust [8]. Reputation systems represent an option to help users identify reliable relationships in the internet, allowing them to evaluate reputation of online seller through the experience of others. In virtual environments that apply reputation systems, users can decide whether or not to trust an online seller based on the probable trust they have on provider of feedback.

In reputation systems the trust transitivity is implicitly taken into account. Trust transitivity is based on recommendation between entities, meaning that entities recommend each other in a chained fashion, based on Trust transitivity principle as illustrated in "Fig. 1", when buyer 1 trusts buyer 2, and buyer 2 trusts the company, buyer 2 suggest company to buyer 1, then buyer 1 derive a measure of trust in the company base the trust on buyer 2.
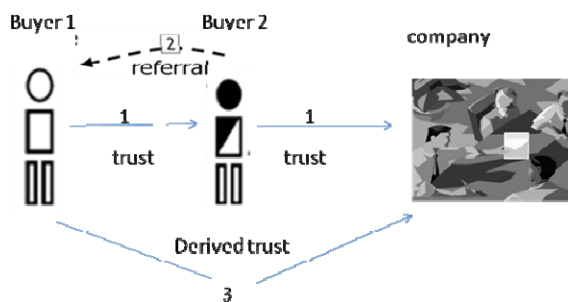

Fig. 1. Trust transitivity principle [9].

However trust transitivity is not as simple as it seems. For example, if Alice trusts Bob and Bob trusts Charlie, then Alice may trust Charlie as well, even though Alice does not know Charlie at all. If you asked why Alice trusts Charlie, she would say it is because she trusts Bob. The transitivity of trust is also known as a derived trust, means that trust is derived from an existing trust between agents. The level of trust through a transitive introduction may hold and is dependent on the strength of the original agent's trust relationship. Transitive trust in the area of reputation is a very important concept where users are identifying quality of services in online environment via a transitive introduction [10].

Reputation is fuzzy in the sense that a transitive introduction is context and time dependent and the dependencies are not always explicit, as there may be an inability to have the same view or understanding about the context and exact time frame in which the trust value or level was assigned [10]. Trustworthiness should also be capability-dependent. That is, the trustworthiness of one agent concerning car sales could be different from that of the same agent concerning car repair and this is mostly agreed [9].

The challenge in current reputation systems is that most receiver and submitter of feedback in reputation systems are anonymous to each other [11], therefore receiver of feedback has to make decision based on the idea of an unknown feedback provider who may submitted fake feedback, or even inaccurate feedback, as he may not be expert in sharing his idea. These characteristics in current reputation system create disturbance in trust transitivity process and put the validity and trustworthiness of feedback doubtful. Users who are seeking information on reputation of relevant e-sellers should take the risk to judge base on the feedback submitted by unknown people.

III. FEEDBACK TRUSTWORTHINESS CHALLENGE

One of the challenges in reputation systems which are the focus of this study is perceived trustworthiness of feedback of reputation systems, which simply means to what extent does feedback receiver, perceives the feedback as genuine, true and reliable. It is important to consider reputation systems as an element in a transitive trust chain that in itself also needs to be trusted [3]. When people think of the incoming information as trustworthy, they will be more confident to adopt the information and use them for making purchase decision [12]. The degree of consideration to which the users perceive the rating and feedback mechanism of the reputation systems as trustworthy will result in them accepting the feedback and use them in the online shopping decision making. Users using reputation systems are interested in knowing the quality of goods and services and the producers via the feedback of other users. The reliability of feedbacks submitter is an important factor that affect thoroughly on validity of submitted feedback. As feedback are submitted via an unlimited number of unknown participants and the information in most reputation systems are unfiltered, this make the information validity uncertain. Thus studying of peoples' willingness to accept the feedback in reputation systems would help to better understand the process by which feedback is being used in consumer's decision making.

To date, there has been lack of research conducted to investigate role of social relation between feedback receiver and submitter in reputation systems. Based on this issue, the main concern of this research is: "how to develop a reputation model for reputation systems based on online social interactions cues?" To respond to the main question, the following research questions are therefore addressed: How can reputation systems utilize the social relationships to improve their performance? What factors effect on users acceptance of feedback in reputation systems? What is the best social reputation model for enhancing acceptance of feedbacks in reputation systems?

IV. IMPROVING FEEDBACK IN REPUTATION SYSTEMS

In this research, the goal is to associate a recipient with the sources that would provide the most acceptable and trustworthy information for making decision. For proposing a reputation model for a social reputation system, we first investigated the necessity of improving the current procedure to enhance the performance of reputation systems. We refereed to "trust transitivity " principle discussed in section 2 , which showed that although implicitly the mechanism of

reputation system is based on trust transitivity but there are some deficiencies on the way it is applied . As most feedback submitters and receivers in reputation systems are anonymous to each, there is no cue on the strength of their relationship or the capability of source of information, therefore it makes disturbance in procedure of trust transitivity and the reputation model of current reputation systems need to be revised and improved to provide the cues for solving this problem.In the second step, we investigated the theories that may help in this problem. The scope of existing theories is often limited to a special research problem, so that no single theory could cover or problem. In this step, the relevant theoretical domains were surveyed to identify the constructs that are proper for developing the proper model. "Acceptance of source's advice" construct has been studies in the areas of social, psychology and marketing with a special emphasis on word-of-mouth influence. Some related theories that were identified were ; word-of-mouth influence theories by [13], [14] and the strength of weak ties theory which discuss in area of knowledge management and specifically knowledge sharing in the works of [15], [16] .

We acknowledge that reputation systems can be improved in different ways, and we are not looking for providing enhancement in all aspects of a reputation system and produce an optimal system, but we are interested on exploring one dimension that include social interaction linking the feedback receiver and submitter. Therefore in third step of this research, we proposed a model of acceptance of feedback in reputation systems as illustrated in "Fig. 2". The goal of our model is to provide the feedback receiver with the sources of information that are the most relevant and trustworthy information. To propose the constructs which are relevant required considering the scope of the problem. We referred to the deficiency in trust transitivity procedure in reputation systems. Because of anonymity of feedback receiver and submitter to each other, there is lack of cues on the strength of relations between involved agents and other constrains exist.

The proposed constructs in the model are based on the social approach that can cover the deficiencies in current chain of trust transitivity in reputation systems. After comprehensive review and analysis of the factors on acceptance of advice in literature and previous works, we proposed homophily, tie strength and source credibility as the main constructs in model of acceptance of feedback in reputation systems.
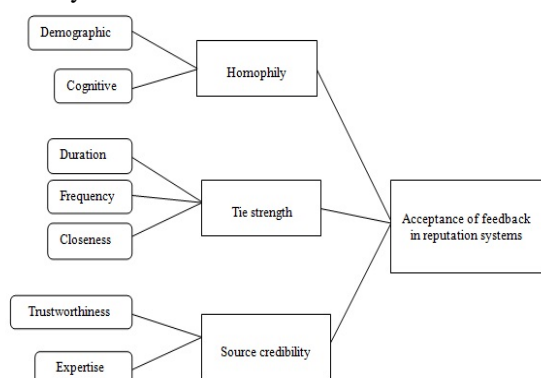

Fig. 2. A view of proposed model on acceptance of feedback in reputation systems.

Homophily refer to the similarities among individuals. It is distinct form tie strength , but it enables the formation of social ties [17]. In previous studies on homophily the effect of it is established on acceptance of a source information [18, 19]. The influence of accepting an individual's advice and idea is created by share of preferences, tastes and lifestyle among people. Shared attitudes and similarities in demographic background have also shown to be an important factor that affect trustworthiness and interpersonal communication among people [14], [18]. Homophily in reputation systems can be existed between the person who submits the feedback and the person who is looking for reputation information (feedback receiver) and it can be measured based on various dimensions of this construct. Brown and Reingen [17] suggested to include measures of attitude/life style similarities between the source and target in studies of word of mouth communication. And on the other hand past researchers have found demographic similarities between source and target are important for explaining the occurrence and effects of word of mouth and it is measured via several dimensions such as age, sex, occupation or level of education[17]. Based on previous research on homophily[20], we also divided it into two category of cognitive homophily (e.g. preferences, attitudes, values) and demographic homophily (e.g. race, age).

Tie strength was first introduced by Granovetter [15] as referring to strength of interpersonal ties. Tie strength is a multi-dimensional construct [15], [18], [21], Strength of ties may range from strong to weak based on frequency of interaction between parties, duration of interaction and closeness. Previous studies showed that strong tie is effective on recipient's advice taking. Tie strength affect in interaction and information sharing among people so that the frequency and level of information sharing among user with stronger tie is more comparing to weak ties among users[17].Research on significance of weak ties on the other hand shows that they are useful due to the novel information source they are [15]. Research on significance of weak ties has revealed that they can be helpful in the flow of information [22], [23]. Therefore it seems in a reputation system the range of information exchange among users who have had pervious established relationship will be more comparing to the exchange of information among unknown people. In addition, strong ties have greater influence on the receiver 's behavior than weaker ties because of frequency and perceived significance of social relationship among strong tie partners[24]. For measuring strength of tie as an affecting factor on acceptance of feedback on a reputation system, we measure duration of the relationship, the interaction frequency and closeness of relationship among submitter and receiver of feedback as an indicator of the strength of relationship among them. These factors have been studied in the literature of advice taking, and these factors are conceptualized as dimensions of tie strength.

Source credibility, another construct in our proposed model is the believability of a source, as perceived by the recipient of the message [25]. Source refers to that individual

who provides the seeker with information when asked. Based on source credibility theory source expertise and trustworthiness are elements that affect the credibility of an information source [26], [27]. Source expertise, refers to the perceived competence of the source providing the correct information, and source trustworthiness is the degree to which a source is perceived to provide information that reflects the source 's actual feeling or opinions [28], [29]. If a credible source tells the user that vender A is trustworthy, the user's trust in vender A is likely to increase. The higher the trustworthiness (is he honest?) and expertise (does he know what he is talking about?) a source is, judged to have, the higher the importance given to information coming from that source [25]. Source credibility has been applied in commercial setting for evaluation of organizations and the judgment of web content, but little research has investigated its applicability in the subject of reputation systems in e-commerce.

In virtual environment, people perceived credibility of their peers could have a significant impact on the online decision making[30]. If people think the receiving information is credible, the possibility of adopting that information and using it for making purchase decision will be increased [31]. In reputation systems the person who is looking for a reputation information about an e-seller on a reputation system, when perceives the provided information by recommender credible, he/she will use it. On the hand if he perceives it as less credible, the effect of the feedback will be reduced, and the reader is unlikely to follow the information provided to avoid the potential risk.

Based on proposed model we suggest using the features and information on social interactions the information that is available via online social networks. There are different types of social data that are available online that competently can be used for a social reputation system, Information such as profile similarity, communication logs and social network data. Profile similarity corresponds to homophily, communication logs maps onto tie strength and social network data relate to the construct of source credibility.

V. DISCUSSION AND CONCLUSION

The main contribution of this research is to improve the performance of reputation systems. This research represents an attempt to improve the performance of reputation systems from the new perspective of utilizing the social interaction cues. This study highlighted the deficiency in trust transitivity chain which is the base of reputation systems mechanism. Although capability and strength of trust relationship of the agents are important condition of trust transitivity, but in current reputation systems these conditions are not provided because most feedback providers and receivers are anonymous to each other.

This research proposes a model of acceptance of feedback which provides theoretical contribution to the study of advice taking. This study enhance understanding of the factors determine the willingness to accept feedback in a reputation system and the role of social interaction information that is important for improving the trust transitivity and consequently the performance of reputation systems. This research proposes to benefit from opportunities of various online social networks for extracting the information on social interaction cues of individuals that are involved as feedback submitter and receiver. Social networks are being suggested as sources for getting the necessary information on the proposed factors in model, which include homophily(similarities), tie strength and source credibility for filtering the provided feedback in reputation systems and presenting the most related and trustworthy information for feedback receivers.

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