A social appraisal mechanism for online purchase decision support in the micro-blogosphere

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ABSTRACT

Owing to the plentiful participation of knowledgeable users, an online social network could be seen as a large group of experts that support the decisions of online users. Collective opinions solicited from friends are largely beneficial for online purchase support and can create significant opportunities for sales. In this paper, a social appraisal mechanism composed using the methodologies of social companionship analysis, collective opinion analysis, and consensus decision analysis is proposed for the online users of the micro-blogosphere. The proposed mechanism can successfully summarize collective opinions and expedite the decision-making process that characterizes users' purchasing behaviors.

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1. Introduction

Social media, such as social networking sites (e.g. Facebook), blogospheres (e.g. Blogspot), and micro-blogospheres (e.g. Twitter and Plurk), have recently been experiencing fast growth. Academics, enterprises, and even individuals are increasingly conducting research and developing business models and applications on social networking sites. A business report by Steegenga and Forge [36] highlights that social media have a greatly increasing influence on consumers' online purchase decisions. Over 50% of consumers would access the Internet and their own social network for online shopping decision support. In this investigation, 35% of consumers report that they read reviews and rank products on social media platforms. Additionally, 25% of these consumers believe that it is important to use social networks to assist with their buying decisions. Recently, consumers have promisingly turned to seek shopping advice from their friends through online media [39]. Therefore, it is worthwhile investigating and designing a novel mechanism for supporting consumers' online shopping decision-making.

Social support is generally defined as help from others when people are facing a difficult life event [5]. That is, social support refers to the assistance available from other people who are part of a social network. In an online shopping scenario, for example, making purchase decisions sometimes constitutes stressful behavior. The stress increases when consumers face a wide range of choices and have insufficient information and few resources; seeking social support thus becomes a helpful way to mitigate the problem. However, the mental stress might not decrease but can even increase if the support provided is not what the recipient wished to receive (e.g. time-consuming or irrelevant information, etc.) [11,41].

The micro-blogosphere provides a lightweight and easy form of communication that enables users to share information with their friends about their activities, experiences, opinions, and status [15]. Users' communication in the micro-blogosphere is faster and more frequent than in the blogosphere. The characteristics of micro-blogs are widely discussed by Jansen et al. and Java et al. [14,15]. The limitation of message length in the micro-blogosphere, i.e. that each message should not exceed 140 characters, enables users to write and read messages more easily and efficiently. With this lightweight communication and the flourishing of mobile devices, users are able to request or provide social support conveniently and in a timely manner as well as receive prompt responses. With its superior properties, the micro-blogosphere is therefore a good social platform on which to seek decision support on online shopping.

In the context of electronic commerce, many sophisticated recommender systems are designed to identify a set of items suitable for and interesting to a user according to his/her personalized preferences, purchase history, past ratings, other similar customers, and so on. Collaborative and content-based are the two main types of recommender systems [40]. For instance, the former, for example the features "Customers Who Bought This Item Also Bought" in Amazon[1] and "See What Other People Are Watching" in eBay,[2] recommends items suitable for the targeted user by collectively analyzing the choices of customers who have similar preferences. The latter, such as the "More Items to Consider" and "Recommendations For You," on Amazon and eBay,

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[1] http://www.amazon.com/
[2] http://www.ebay.com/

respectively, identifies items suitable for the current user based on what she/he has viewed. These recommendation systems are mainly developed by online retailers for the purpose of sales improvement. However, customers in the new economy have begun to mistrust official advertising/recommendations [21] and are turning to rely on the opinions and social appraisal support from their close friends. As previous research [12] has noted, social support is one of the important functions of social networks; however, methods for building social support mechanisms on online media have not been widely discussed. From the perspective of customers' interests, it is beneficial to develop an appropriate appraisal system that can analyze collective opinions to enhance online purchase decision support.

The goal of this research is thus to investigate ways in which to achieve external appraisal support for online purchasing through the micro-blogosphere. Three main research questions are to be studied in this research:

(1) *How can the social companionship between the support requester and decision supporters be identified?* Because closer friends might understand our preferences, habits, and needs better, their appraisals should be more reliable than those of others. Therefore, the relation closeness between a decision requester and his/her friends plays an important role in the appraisal process.

(2) *How can the collective opinions given by decision supporters be analyzed and consolidated?* The opinions/appraisals given in a micro-blog are generally short and are likely to be vague. To exploit the wisdom of the crowd from the friend network of a decision requester, the opinions of decision supporters with different friend closeness have to be analyzed semantically and integrated structurally.

(3) *How can the decision consensus on the alternative ranking to support online purchasing be obtained?* Each support requester has individual preferences regarding the purchase decision criteria. It is thus effective and essential to rank the alternatives appropriately by consensually considering personal preferences and collective external evaluations.

In this research, we propose a social appraisal mechanism (SAM) that integrates the methodologies and techniques of social network analysis (SNA), intuitionistic fuzzy sets (IFSs), and the technique for order preference by similarity to the ideal solution (TOPSIS) to achieve social decision support for online users. Through the proposed mechanism, online users can efficiently reduce their decision-making processes and reduce the risk of purchasing an unsuitable product.

The remaining parts of the paper are organized as follows. In Section 2, we discuss the existing literature related to our research topics. In Section 3, we propose the SAM combined with SNA, IFS, and TOPSIS. An empirical experiment is studied in Section 4. Section 5 provides the experiment results and evaluations. Section 6 concludes our research contributions and presents future research directions.

2. Literature review

2.1. Social support mechanism

Social support is a concept that involves the help provided by other people and the social network as a mediating construct of social support [9]. It provides people with a trusted environment for information exchange with friends. The opinions of the people with close friendships in social networks could be seen as helpful sources of social support, for example, by providing answers to questions. Generally, a social network is expressed as the structural aspect, while social support is investigated from the utilization aspect of a social network [33].

Social support and SNA are mutually reinforcing. They form one of the important functions of social networks [12]. Recently, the utilization of a social network in electronic commerce has mainly focused on information filtering [24,27,48] and spreading [14,20,46]. Meo et al. [27]

propose an approach to recommend resources (e.g. similar users or articles) to a user in the social networking environment. Liu et al. [24] propose a novel hybrid recommendation method that integrates the segmentation-based sequential rule method to consider the sequence of customers' purchase behavior over time. Jansen et al. [14] find that the micro-blogosphere is an excellent platform for word-of-mouth communication and discuss how firms can build word-of-mouth marketing strategies to spread brand information based on social networking and trust. People's behaviors in broadcasting information they would like to share with their friends are explored by Zhao and Rosson [46].

These existing studies mainly aim to filter or provide information (e.g. filter unsuitable products and provide the products that users might be interested in) to increase business opportunities. Although a large amount of research has been undertaken on information filtering and dissemination for increasing business opportunities on the firm side, few systems have been developed for the social support of users' online shopping behavior. Thus, the aim of the current paper is to develop a SAM for online purchase support.

2.2. Companionship and SNA

The provision of social appraisal support is one of the important functions of social companionships. Social companionship is a ubiquitous part of psychological and behavioral functions over time. Recently, SNA has become one of the most important methodologies for estimating tie strength by investigating the complex activities of actors in a social networking environment. According to SNA, a person with more connections (e.g. friendship or interaction) is more important and influential than another with fewer connections [44]. Generally, the stronger the tie strength between two actors, the deeper the relationship they have [34]. That is, they might know each other's preferences, habits, and needs.

In practice, the structural dimension (e.g. possessing friend networks [7,35]) and the behavioral dimension (e.g. interaction frequency [20,22]) are two measurement proxies that substitute for tie strength. Granovetter [7] defines tie strength as the relative overlap of the neighborhood of two nodes in networks. Shi et al. [35] indicate that communities are composed of various people with strong ties, and social networks are composed of overlapping communities. Li and Du [22] use the frequency of interactions to represent the social tie and measure the relationships between blog readers and authors by analyzing similarity.

When the ties between two persons are stronger, they will be more willing to share opinions with each other openly. Levin and Cross [20] use the interaction effects between knowledge seekers and knowledge sources as one of the important factors to investigate the effectiveness of knowledge transfer. In this research, we use the measurement of social companionship to model the importance level of a social supporter's opinion.

2.3. Vague information and multi-criteria decision-making

The opinions received from a person's friend network play an important role in the human decision-making process [17]. However, the opinions expressed by natural language are likely to be vague. As a result, the related decision information (i.e. criteria weights and criteria evaluation of alternatives) might be completely unknown or incompletely known in a decision-making process because of the time pressure, lack of knowledge, and limited expertise of decision supporters regarding the problem domain [4]. Recently, IFSs have been found to be highly useful in dealing with vagueness on the semantic web [10,20]. Conceptually, an IFS, which has feasible presentation for the degree of membership, degree of non-membership, and degree of uncertainty [2], is very well suited to modeling the fuzziness and uncertainty of opinions used in social appraisal support. In order to handle the issue of vague information gathered from social networks and deal with