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A concept-level approach to the analysis of online review helpfulness



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ABSTRACT

Helpfulness of online reviews serves multiple needs of different Web users. Several types of factors can drive reviews' helpfulness. This study focuses on uninvestigated factors by looking at not just the quantitative factors (such as the number of concepts), but also qualitative aspects of reviewers (including review types such as the regular, comparative and suggestive reviews and reviewer helpfulness) and builds a conceptual model for helpfulness prediction. The set of 1500 reviews were randomly collected from TripAdvisor.com across multiple hotels for analysis. A set of four hypotheses were used to test the proposed model. Our results suggest that the number of concepts contained in a review, the average number of concepts per sentence, and the review type contribute to the perceived helpfulness of online reviews. The regular reviews were not statistically significant predictors of helpfulness. As a result, review types and concepts have a varying degree of impact on review helpfulness. The findings of this study can provide new insights to e-commerce retailers in understanding the importance of helpfulness of reviews.

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1. Introduction

The development of Web 2.0 has encouraged people to express their opinions about products/services. Opinions are central to most human activities and hence, are one of the key drivers of human behaviors (Hu & Liu, 2004). These opinions can help consumers in purchase decisions (Liu, 2010). There are varieties of opinions that discuss different aspects of a purchase of a product/service. Early research on online reviews has identified and studied two types of opinions, namely (1) regular and (2) comparative (Jindal & Liu, 2006b). Witnessing exponential proliferation of reviews in recent years, along with the diversity of the uses and functions these perform, this dual classification seems too narrow. More recently, suggestive have been identified as a third type of reviews (Qazi, Raj, Tahir, Waheed, et al., 2014). In linguistic,

suggestives are defined as indirect speech acts. The speech acts used to direct someone to do something in the form of a suggestion are classified as suggestives. They can be considered polite in the sense that instead of telling someone to do something directly, they present it in the form of a suggestion, which the reader is not obliged to follow (Kumar, 2011). The appearance of multiple review types (regular, comparative and suggestive) significantly contributes in making variety of consumption choices and future guidelines that enables consumers as well as retailers to make better purchase decisions and business policies.

The reviews types are defined based on their linguistic construct (Liu, 2012) that expresses different sort of information. A *regular opinion* is often referred to simply an *opinion* in the literature (Jindal & Liu, 2006b). A *comparative opinion* expresses a relation of similarities or differences between two or more entities (Jindal & Liu, 2006a). A *suggestive opinion* is defined as directing someone to do something in a polite manner (Qazi, Raj, Tahir, Cambria, & Syed, 2014). The classification of these types of reviews assigned "A" to regular, "B" to comparative and "C" to suggestive opinions (Jindal &

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Liu, 2006a; Qazi, Raj, Tahir, Waheed, et al., 2014). In the competitive business environment users experience difficulty in taking decisions if they only look at one aspect of a product (Ganapathibhotla & Liu, 2008; Liu, 2012). Clearly, different types of opinions carry variety of aspects, e.g. the notion of product comparisons is another aspect that is not only useful for product manufacturers, but also for potential buyers, thus helping in better decision making (Jindal & Liu, 2006b). Many studies suggest that online product reviews and related features have a significant impact on consumers' purchase decision and sales (Duan, Gu, & Whinston, 2008; Elwalda, Lü, & Ali, 2016; Forman, et al., 2008).

Among the many features associated with online product reviews, 'review helpfulness' is particularly important, as it represents the subjective evaluation of the review judged by others (Cao et al., 2011; Li, Huang, Tan, & Wei, 2013). Therefore, helpful reviews improve the value of business sites, and sites containing more helpful reviews are more likely to attract buyers and consumers seeking information. Major Websites, such as Amazon.com, Tripadvisor and Yelp.com, ask readers to rate the helpfulness of the reviews of products/services and make that information available. This implies that online retail sites with more helpful reviews offer greater potential value to customers. Such reviews are useful for better and well-informed decisions, and, hence, maximize users' satisfaction (Kohli, Devaraj, & Mahmood, 2004). However, helpfulness of online reviews is a multi-faceted concept that can be driven by several types of factors based upon quantitative and qualitative measures. In the early studies, the most common practice to measure the review helpfulness was based upon the quantitative factors of reviews such as the star rating or thumbs up/down and the review length (Otterbacher, 2009; Pang, Lee, & Vaithyanathan, 2002).

More recent studies have focused on qualitative measures in addition to quantitative ones (search goods, search experience, experience, reviewer impact, reviewer and cumulative helpfulness) to explore helpfulness (Huang, Chen, Yen, & Tran, 2015; Mudambi & Schuff, 2010). However, by looking into the multiple review types and associated vital aspects, helpfulness is quite a complex concept as one would equate quantitative measures of reviews to helpfulness, while others might consider qualitative instead. Therefore, this study was designed to extend existing research on online review helpfulness by viewing not just the quantitative factors (such as word count), but also qualitative aspects of reviews such as review types itself (including regular, comparative, suggestive reviews and cumulative helpfulness).

The study contributes to the conceptual development and understanding of the helpfulness components of reviews from a concept-level prospective. Built on the relevant online review literature, four hypotheses were proposed (H1, H1, H3 and H4) to study the proposed model for reviews' helpfulness. The dataset consisting of 1500 hotel reviews from Tripadvisor was employed to test these hypotheses. This study successfully validated the proposed model and found key factors to make an opinion helpful for readers. The results of the current research have contributed to relevant literature by providing further understanding of the morphological features (quantitative and qualitative) of reviews and their influence on helpfulness. Additionally, the findings of the paper have extended the results found in existing research (Mudambi & Schuff, 2010) by looking also at the review types (regular, comparative, and suggestive) to see whether each of those aspects influences online review helpfulness.

This paper is organized as follows: in Section 2, related work is presented; Section 3 presents the proposed model and related hypotheses; Section 4 presents the research methodology; Section 5 discusses evaluation results; Section 6 concludes the discussion; Section 7 presents conclusions and future work and Section 8

explains the implications of the study.

2. Literature review

The study of reviews is commonly termed opinion mining, defined as an interdisciplinary research field involving natural language processing, computational linguistics, and text mining (Thet, Na, & Khoo, 2010). Textual information is generally of two types: subjective and objective (Ganapathibhotla and Liu, 2008) and opinions are expressed by way of subjective expressions (Quigley, 2008).

Today opinion mining and sentiment analysis are mainly carried out at two levels: word-level and concept-level. Word-level analysis includes approaches such as keyword spotting, lexical affinity, and statistical methods. Concept-level analysis, instead, does not take words as basic elements for text analysis, but rather multi-word expressions. An expression such a "cloud computing", for example, is a semantic atom in concept-level opinion mining, but two different words ("cloud" and "computing") in word-level analysis. Hence, concept-level analysis better preserves semantics associated with natural language (White, 2014). Common approaches to concept-level sentiment analysis include taxonomy-based methods (Gangemi, Presutti, & Reforgiato Recupero, 2014) and common-sense-based approaches (Cambria, Gastaldo, Bisio, & Zunino, 2015).

As mentioned earlier, sentiment analysis reviews are of different types: regular opinions, pertaining to a single object or entity, and comparative opinions, which discuss more than one object (Jindal & Liu, 2006a, 2006b). The regular opinion is mostly used to find good or bad views about a particular product whereas comparative opinions are significantly utilized for competitive intelligence (Jindal & Liu, 2006a). Existing works cover different aspects of regular opinions (Popescu & Etzioni, 2005) (Liu, Hu, & Cheng, 2005) (Cruz, Troyano, Enríquez, Ortega, & Vallejo, 2010) (Hariharan, Srimathi, Sivasubramanian, & Pavithra, 2010). The comparative sentence mining concept originates from Liu et al. in (Jindal & Liu, 2006a), and it is then considered further in (Ganapathibhotla & Liu, 2008; Hou & Li, 2008; Jindal & Liu, 2006; Li, Lin, Song, & Li, 2010; Xu, Liao, Li, & Song, 2011; Xu et al., 2011). The suggestive reviews as a third significant type of reviews have been examined recently by (Qazi, Raj, Tahir, Waheed, et al., 2014).

Classifying reviews is imperative because different types make different information-consumption choices (Jindal & Liu, 2006b). An example opinion sentence is "the service quality of hotel X is poor". An example comparative sentence is "the service quality of hotel X is not as good as that of hotel Y". Clearly, these two sentences give different information. Their language constructs are quite different too. Identifying comparative sentences is useful in practice because direct comparisons are perhaps one of the most convincing ways of evaluation, which may even be more important than opinions on each individual object (Jindal & Liu, 2006a; Liu, 2012). A suggestive review is characterized by the suggestion of a solution to a particular issue regarding an entity or a group of entities. For example "I suggest hotel X to better use the services and make your trip worth visiting". An important application area for such solution is business intelligence, as product manufacturers always wish to recognize consumers' opinions about several aspects of their services. These varieties of online reviews are widely used as convincing communication. The tourist's buying behavior is influenced by looking into different aspects of the reviews available through web 2.0 (Sparks, Perkins, & Buckley, 2013). The study by (Cui & Ryan, 2011), for example, found out that both urban and rural residents have favorable attitudes toward tourism. This indicates the urgency of more helpful online reviews to promote tourism business.

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