

An idea generation model based on online consumers' complaints: a hybrid approach

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Abstract

In view of growing demand of ideas on innovation, a lot of enterprises devote their efforts to search a stable mechanism to help develop ideas from internal or external environment. According to this motivation, an idea generation model based on online complain messages (IGM_{occ}) is proposed. By employing natural language processing (NLP) and unsupervised machine learning algorithm, the proposed model briefly extracted topics and derive suggestive ideas from a large number of online complaint messages. In this research, company A is targeted to demonstrate the operation of the model, and 2474 valid data were collected from 2018/8/1 to 2022/3/31. Based on the extracted topics and suggestive rules, model evaluation is conducted by experts and shows qualified values of application and feasibility. It is expected that the proposed model can provide innovative enterprises with a long-last and cost-down mechanism for idea generation.

Keywords: Idea generation model, natural language processing, data mining, unsupervised learning

1. Introduction

A creative idea is the root of all innovations and significantly affect the final outcome of innovation, so that how to constantly generate the ideas possessing commercial value has become an important issue for innovative enterprises (Jeong et al., 2019; Choi et al., 2020; Zhang et al., 2020). Due to the important role of creative ideas on innovation, most enterprises endeavor their efforts on finding a mechanism from internal or external to help constantly generate ideas (Jacob Mgan, 2015; Lipkowitz, 2011; Lee et al., 2018). In this situation, open innovation, which is proposed by von Hippel (1982) to state the importance of user involvement on innovation outcome (von Hippel, 1986; Morrison et al., 2000) has been regarded as an alternative way to achieve innovation. Recent trendy of social media exactly provides users with a proper platform to post their feedbacks even complaints about the existing products provided by the enterprise. In these complaint messages, although they are liable to be personally unhappy consuming experiences, these negative feedbacks are gradually used to improve customer relationship management or service quality (Yilmaz et al., 2016; Yan et al., 2021). As the requirements of creative ideas increase swiftly by enterprises, a lot of previous

research try to search for valuable ideas by mining users' opinions on online communities (Hyysalo & Usenyuk, 2015; Choi et al., 2020; Zhang et al., 2020). Compared with users' opinions, complaint messages are supposed to contain more materials beneficial for product/service improvements since they may indicate the parts that current product/service is imperfect. Thus, by examining users' complaints, enterprises are possible to obtain some clues associated with users' expectation for current product/service or requirement for new product/service. However, with the booming development of social media, the amount of complaint messages may grow exponentially and make data utilization become difficult. So that, how to interpret and analyze so huge amount of messages to assist in ideas generation has become a major challenge for those enterprises that attempt to achieve open innovation by exploiting online social messages (Lee et al., 2018).

Fortunately, with breakthroughs of the techniques of natural language processing (NLP), analyzing the textual contents has become easy and feasible. Due to the characteristics of unstructured format, text was the contents hard to be analyzed in the past. By adopting the techniques of topic modeling, large-scale documents can be summarized through transforming into bag-of-words and estimating the probability distribution of topics/words. Latent Dirichlet Allocation (LDA), the most well-known techniques of topic modeling, employees unsupervised learning to explore the latent topics in the corpus, so that it has begun to be used for assisting in topic extraction for social media data. The derived topics also provide an ideal foundation for more business applications, such as opinion mining, document clustering, event detection, recommendation system, etc. (Annisa et al., 2019; Bastani et al., 2019; Ding et al., 2019; Agarwal et al., 2020; Akrouchi et al., 2021; Zeng et al., 2022). Although some successful experiences of adopting topic modeling have been indicated in previous research, most of applications still lie in commercial field instead of innovation one.

On the other hand, with the rapid development of artificial intelligence, the technique of data mining has been gradually applied in disclosing the rules behind a huge amount of data for specific purposes. In order to deal with textual data, some research try to adopt the techniques of data mining along with topic modeling in order to find the clues beneficial for the purpose of creative idea generation (Meik, 2014; Andersson et al., 2016; Geum & Park, 2016; Christensen et al., 2017a; Christensen et al., 2017b; Lee et al., 2018; Liu et al., 2019; Kao et al., 2018; Kao et al., 2019; Kim & Ju, 2019; Choi et al., 2020; Han et al., 2020; Zhang et al., 2020; Ozcan et al., 2021). By decomposing the text into a combination of words with the technique of text mining, and the result is then analyzed with mining technique or sentiment analysis to search for more opportunities for better products or services (Christensen et al., 2017a; Christensen et al., 2017b; Lee et al., 2018; Kim & Ju, 2019; Liu et al., 2019; Choi et al., 2020; Han et al., 2020). In some prior research, topic modeling (e.g., LDA) was the commonly used technique for obtaining multiple topics from a large number of textual messages on online communities. Based on the resulting topics, data mining or sentiment analysis can be introduced

to discover the signs for developing new product (Pournarakis et al., 2017; Jeong et al., 2019; Lee & Sohn, 2019; Ozcan et al., 2021). Although prior research has indicated some feasible approach about combining topic modeling and data mining on idea creation, there is still no clear consensus on how to derive ideas from the obtained topics.

Thus, in this research, IGM_{occ} (Idea Generation Model based on Online Customers' Complaints) is proposed. By adopting the techniques of topic modeling and unsupervised learning, creative ideas can be derived from a huge number of complaint messages collected from online communities. Due to the characteristic of unsupervised learning, association among the words under each topic can be performed and used as a robust basis for idea generation. Through the propose of this model, it is expected to provide enterprise with an efficient and low-cost way to generate valuable ideas from customers' complains on online communities.

2. Framework of IGM_{occ}

According to the motivation and research goal, an idea generation model is developed based on online customers' complaints (IGM_{occ}). By mining the complaint messages of online community, the proposed model is expected to enlarge the idea sources for enterprises. In order to describe the operation of the proposed model, the framework of IGM_{occ} is illustrated in Figure 1.

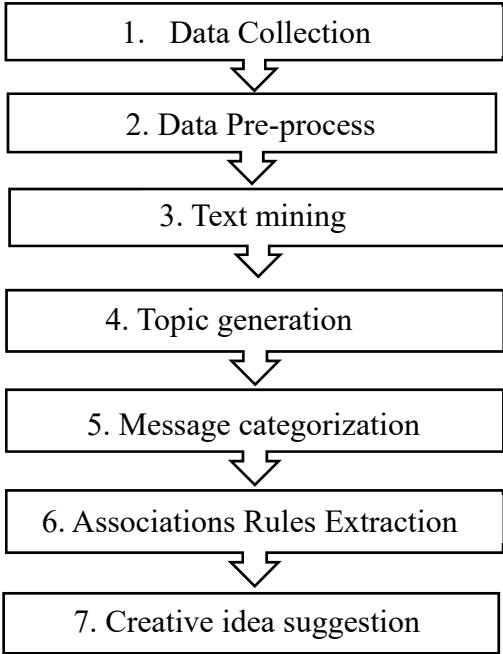


Figure 1: Framework of IGM_{occ}

3. Model verification

In order to confirm the process of the proposed model and the generated outcome are reasonable, five experts with domain knowledge or relevant experiences were invited to evaluate IGM_{occ}. The questionnaire comprises of several facets related to the application and the feasibility of IGM_{occ}. The feedback of experts was summarized as follows: (1) the process of IGM_{occ} including data collection, processing, and output are reasonable and clear to be a guideline to be followed; (2) Regarding each topic, the extracted suggestive ideas make sense and may have significant effects on idea generation by expanding thinking space; (3) By mining a large number of online users' complaints, IGM_{occ} show an efficient and cost-down approach to innovation, but the success of the model still mostly rely on expertise in rule interpretation.

4. Conclusion

This research is motivated to resolve the problems of limited resources in terms of idea generation. By integrating NLP, topic modeling and unsupervised learning algorithm, IGM_{occ} is proposed to provide a hybrid approach to develop creative ideas based on users' complaint messages. In this research, company A is targeted and taken as an example to explain the procedures of the model. In order to confirm the applicability and feasibility of the proposed model, model verification is carried on by experts. It is expected that the proposed model not only can turn the negative complaint messages into materials of idea development, but also can demonstrate the utilization of mining techniques on innovation.

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