

A Method for Eliciting Customer Requirements from Question Sentences



Neunghoe Kim, Chanki Hong

Abstract: *The modern development of the internet has led to product information being provided in online markets. User reviews provide various types of information in addition to product information; they comprise a channel for communicating product information and affect consumer purchasing decisions. As such, user reviews can have a significant influence on sales. However, they are also noted as a place for identifying user needs because a large number of user reviews can be obtained at low cost. User review analysis generally uses opinion mining methods, which largely divide reviews into being positive, negative, or neutral; analysis is performed only on positive and negative user reviews after neutral reviews are discarded. User reviews containing question sentences are judged to be neutral, yet they can contain content important for identifying user needs. Therefore, this paper proposes a method to derive customer requirements from the user reviews containing question sentences. It is shown that user needs are contained within these user reviews through analysis of the results. New user needs can be found through this method and a large number of user needs can be obtained at low cost.*

Keywords : *Customer requirement, Opinion mining, Requirement engineering, User review analysis.*

I. INTRODUCTION

In the past, word of mouth had a significant influence on purchasing decisions. However, purchasing information has recently migrated online due to the rapid growth of the Internet; companies providing a wide variety of product information have been created [1]. User reviews, product information, comments from experts, and personalized advice, generated through automated recommendation systems, are provided [2]. User reviews have become an important channel for communicating product information; consumers rely on this information to make purchasing decisions [1], [3]. In addition, user reviews were found to have a positive effect on sales [1], [3-5]. From this, it can be said that user reviews have a significant influence on sales; user reviews are also noteworthy as a place for identifying user needs through the free posting and sharing of user opinions. This is because a large number of user reviews can

be obtained at relatively low cost compared to traditional methods used for identifying user needs.

The opinion mining method is generally used to identify user needs from user reviews. The opinion mining method is a method that 1) extracts user reviews from sites serving user reviews, 2) uses positive and negative word dictionaries to

check for positive and negative words, and 3) finally elicits user reviews deemed as positive and negative; the results are then analyzed by relevant stakeholders. There are reviews, however, that are excluded by typical opinion mining methods. User reviews with question sentences are nearly impossible to evaluate; positive and negative user opinions are expressed through positive and negative words. The opinion mining technique divides and classifies reviews as being positive or negative or neutral and discards those deemed as neutral. User review analysis is only performed for positive and negative reviews; a source of neutral reviews are reviews written with a question sentence. Discarded reviews, however, can have important clues for identifying user needs that would otherwise be overlooked. Therefore, in this paper, we propose a method for eliciting customer requirements from discarded user reviews containing question sentences.

II. A METHOD FOR ELICITING CUSTOMER REQUIREMENTS FROM QUESTION SENTENCES

A method for eliciting customer requirements from discarded user reviews is proposed. This proposed method assumes that similar products have already been released, are being sold in the market, and are being used and reviewed by users online.

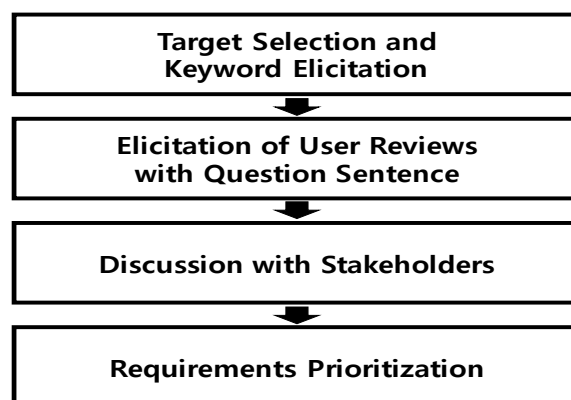


Fig. 1. Overall customer requirement elicitation method.

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A. Target Selection and Keyword Elicitation

The target selection and keyword elicitation stage is an activity that selects a target among user review services and elicits keywords to identify customer needs.

User reviews exist on a variety of services including consumer opinion websites, blogs, internet forums, and social networks. The processes of target service selection and keyword elicitation are necessary because performing an unfiltered review without elicitation of specific keywords, across various review services related to the product in question, is prohibitively expensive from a time and cost standpoint.

B. Elicitation of User Reviews with Question Sentence

The elicitation stage extracts user reviews containing question sentences from the selected service, and elicits keywords from the user reviews in question. Because user reviews are written in natural language, user reviews of the service are analyzed according to basic natural language processing (NLP) techniques. If, through the analysis, sentences that contain keywords and questions are searched and a sentence is found, the entire user's opinion including the sentence is derived to identify the user's needs.

C. Discussion with Stakeholders

The stakeholder discussion stage is an activity where relevant stakeholders define requirements through discussions of user reviews elicited from keywords and question sentences. User reviews with question sentences cannot be judged as positive or negative, yet they cannot be ignored because they contain user needs that are too important to omit from user review analysis. However, because there are many user reviews that raise questions through the use of question sentences and or reviews that present specific situations or opinions based on user experience, the activities that relevant stakeholders perform to identify, discuss, and translate user reviews into general requirements are required.

D. Requirements Prioritization

The requirements prioritization phase is an activity that prioritizes the defined requirements and determines which requirements are to be reflected within a product's development and release schedule. Not all requirements can be fulfilled at once, as each requirement has associated with it a unique time and cost; in addition, a product has a defined development and release schedule. Therefore, it is important to determine an optimal combination of requirements to maximize customer satisfaction while observing existing constraints.

III. RESULT ANALYSIS

In order to find an effective method of customer requirements elicitation from user reviews containing question sentences, this study conducted requirements elicitation for the iPhone.

A. Study Plan

Amazon, which is widely used worldwide, was selected as the subject service. The keywords *photo*, *camera*, *music*, *memory*, *sensor*, and *Wi-Fi* were elicited through a survey of

iPhone users. User reviews were analyzed with basic natural language processing (NLP) techniques and keywords and questions were elicited.

Table I: iPhone user reviews with question sentences

User Review	Quality Attribution
Can you connect your iPhone 6 to your PC/laptop, if you want to transfer photos/videos there?	Interoperability
Do you know how to silence your phone camera's sound?	Usability
Do you know how to download and play music from your computer for free on this phone using the music app?	Interoperability
Does the shutter sound of the camera turn off?	Usability
Is it possible to add an SD memory card?	Interoperability
Does it have a fingerprint sensor?	Usability
Do these phones provide internet sharing via Wi-Fi?	Usability
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.	.
.	.

B. Study Result

A large number of user reviews with question sentences were elicited and were confirmed to contain significant user needs. Some of the user reviews that were found are similar to those found in Table I; some sentences were partially corrected to account for errors in typing and for privacy reasons; the basic content is unchanged.

As suggested in the Table above, it was confirmed user needs related to usability and interoperability need to be identified because they are considered to be closely related to users in the mobile phone area.



These needs were uncovered extensively from reviews that would have been otherwise discarded and thus not analyzed. Through this analysis, we were able to confirm that discarded reviews containing question sentences are also an important source of information for user needs.

The analysis presented up to this stage describe the results achieved by performing only two out of the four stages proposed in this paper. Although results arising from the complete application of only two (and not all four) stages were analyzed, the necessity of analyzing user reviews containing question sentences was clearly confirmed. We plan to apply this method to actual projects and to verify its efficiency in future research.

IV. CONCLUSION

This paper proposes a method for eliciting customer requirements from user reviews containing question sentences; these user reviews are judged as neutral and are discarded, yet they contain information describing important user needs. We formulated our method to elicit customer requirements from question sentences. This method consists of four stages: target selection and keyword elicitation, elicitation of user reviews containing question sentences, stakeholder discussions, and prioritization of requirements. In addition, through results analysis, we have confirmed that there are important user needs in actual user reviews containing question sentences. It is possible through this method to identify the needs of important users in neutral questions that are not considered by general opinion mining methods; thus, a significant number of user needs can be found and obtained at a low cost.

In future research, we will verify the effectiveness of this method by applying the method to the actual requirements development stage and by comparing and analyzing the results of existing user needs.

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