

Cost-Benefit based User Review Selection Method

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Abstract

User reviews posted in the application market show high relevance with the satisfaction of application users and its significance has been proven from numerous studies. User reviews are also crucial data as they are essential for improving applications after its release. However, as infinite amounts of user reviews are posted per day, application developers are unable to examine every user review and address them. Simply addressing the reviews in a chronological order will not be enough for an adequate user satisfaction given the limited resources of the developers. As such, the following research suggests a systematical method of analyzing user reviews with a cost-benefit analysis, in which the benefit of each user review is quantified based on the number of positive/ negative words and the cost of each user review is quantified by using function point, a technique that measures software size.

Keywords: *User Review, Cost-Benefit Analysis, Application Market, Requirement Prioritization*

1. Introduction

Within the application market, people use user reviews to freely share what they want to including their own personal experiences. There have been numerous researches related to user reviews as they are closely related to user satisfaction and its significance has been emphasized in many previous studies[1-6]. Application developers attempt to identify the current needs and potential needs of users based on user reviews. User reviews are crucial data as they are essential for improving applications after its release and are the key components of determining the application's success or failure due to its relevance with user satisfaction[7-8].

However, infinite amounts of user reviews are posted per day and due to their limited resources, application developers are unable to examine every user review and improve the application. If user reviews are analyzed and needs are addressed in a chronological order, less significant needs may be prioritized in the process of application improvement and the application will be unable to satisfy users. As such, in order to select the crucial needs that are directly related to user satisfaction, a systematical method of analyzing the significant user reviews is necessary.

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2. Proposed method

The objective of the following research is to select the user reviews that contain more benefits compared to its cost by using the concept of cost-benefit analysis. Within the cost-benefit analysis there are 2 main components which are benefit and cost, and the following research quantifies the benefit of each user review by subtracting the number of positive words from negative words within the review. This is because the following research believed that addressing reviews with more negative words compared to positive words would lead to increased efficiency and user satisfaction. Furthermore, the cost of a user review was quantified by using function point, a technique that measures software size. The cost-benefit analysis is an equation which has been used to calculate the cost of addressing user reviews compared to its potential benefits. The equation is shown as (1) and the following study has used equation (2) to quantify the benefits and costs.

$$\text{Benefit/Cost} \quad (1)$$

$$\text{Number of negative words} - \text{Number of positive words}/\text{Function point} \quad (2)$$

The systematic method of selecting crucial user reviews using the concept of cost-benefit analysis consists of 4 steps which are user review collection and sentiment classification, benefit quantification of user review, cost quantification of user review, user review selection and requirement elicitation as shown below in picture 1.

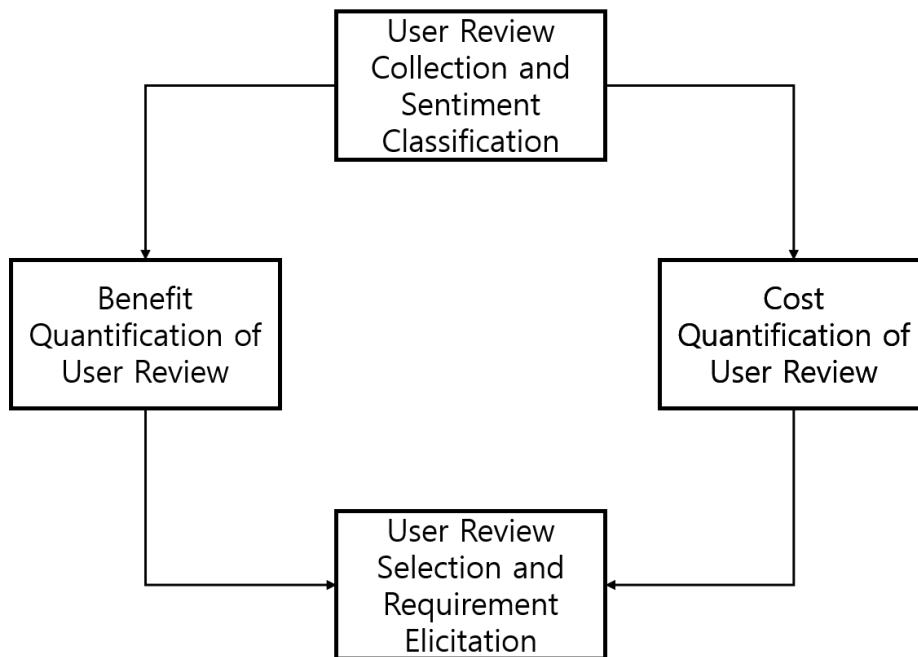


Figure 1. Overall steps of the proposed method

2.1 User Review Collection and Sentiment Classification

The following step collects user reviews posted during a set period of time and classifying the general tone of the reviews. The developer sets the period and collects user reviews. And the collected reviews undergo an NLP(Natural Language Processing) to decide whether the words are positive or negative based on a sentiment dictionary.

2.2 Benefit Quantification of User Review

The following step quantifies the benefits of the user reviews based on the number of positive and negative words used. As reviews with numerous negative words are more crucial, the benefit is quantified by subtracting the number of positive words from the number of negative words. A user review becomes more crucial if it contains more negative words, and becomes less significant if it contains more positive words.

2.3 Cost Quantification of User Review

The following step quantifies the cost of user reviews by using function point. The function point quantifies the necessary cost by assuming that the contents mentioned in the reviews are added to the software. Function point quantifies the function of the software by measuring the software size. This method is known to be an objective method for measuring software development workload.

2.4 User Review Selection and Requirement Elicitation

The following step selects user reviews and elicits requirements based on the concept of cost-benefit analysis by using the statistics quantified in previous steps. During the Step 2 and Step 3, benefits and costs were quantified and these statistics may be used for the cost-benefit analysis of each review. And based on the results, the crucial user reviews may be prioritized. And requirements are elicited from the reviews in order to proceed with additional development with available resources.

Table 1. Example of the result of the cost-benefit analysis

Item	Benefit	Cost	Cost-Benefit
User review 1	3	2,000,000	0.0000015
User review 2	-4	1,000,000	-0.000004
User review 3	7	3,500,000	0.000002
User review 4	0	1,500,000	0
User review 5	-5	1,000,000	-0.000005
User review 6	1	2,000,000	0.0000005
User review 7	0	1,000,000	0

User review 8	8	4,000,000	0.000002
User review 9	3	1,500,000	0.000002
User review 10	-2	1,000,000	-0.000002

Table 1 shows the examples of cost-benefit analysis results calculated from the Step 4. According to the table, the needs mentioned in reviews should be considered for additional application development in the following order: User review 3, User review 8, User review 9, User review 1, User review 6, User review 4, User review 7, User review 10, User review 2, User review 5.

3. Conclusion

The following paper proposes a systematical method, which consists of 4 steps, for selecting user reviews by using the concept of cost-benefit analysis to define benefits and costs of user reviews. The 4 steps consist of user review collection and sentiment classification which collects user reviews posted during a set period of time and classifying the general tone of the reviews, benefit quantification of user review which quantifies the benefits of the user reviews based on the number of positive and negative words used, cost quantification of user review which quantifies the cost of user reviews by using function point, and finally user review selection and requirement elicitation which selects user reviews and elicits requirements based on the concept of cost-benefit analysis by using the statistics quantified in previous steps. The following method addresses reviews that have higher ratio of benefit to cost and thereby maximizes satisfaction of application users while utilizing limited resources. For further research, we hope to implement the following method in real case to prove its utility and to develop an automatized mechanism to support this method.

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