

Evaluating Indicators of Answer Quality in Social Q&A Websites

Research-in-Progress

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Abstract

The quality of answers in the CQA website varies a lot. Many indicators influence the quality and their importance are not the same. In order to identify the important indicators and make target improvements, in the paper, DEMATEL-ANP are used. The analyzing results show that Cognitive, Information sources, Socio-emotional are the casual aspects, and Novelty, Effectiveness, Understandability, Reference to external sources as well as Solution feasibility are important influencing factors. These aspects and indicators should be paid more attention as they are more important for improving the quality of answers and guiding posting more high-quality answer.

Keywords: Social Q&A site, Indicators of answer quality, DEMATEL-ANP

Introduction

With the development of Web 2.0, more and more social Q&A websites emerges (Yang et al. 2019). In social Q&A websites, members can post questions and other members can give answers to these questions (Zhang et al. 2019). Because of its openness, the quality of answers cannot be safeguarded and quality of answers varies a lot (Elalfy et al. 2018). Many indicators have influence on the quality of answers(Fu and Oh 2019). However, the importance of these indicators for the quality of answers are not the same. Therefore, it is necessary to discriminate these indicators. More attention should be paid to the important factors, which will guilds the posting of high quality of answers.

Therefore, in the paper, the Decision Making Trial and Evaluation Laboratory (DEMATEL) - Analytic Network Process (ANP) (Pei et al. 2012) are adopted to discriminate the indicators of quality of answers. The process of the DEMATEL-ANP, as is shown in Figure 1, is illustrated as follows(Pei et al. 2012). First, the answer quality indicators are collected. The influence between indicators and comparable importance between indicators are evaluated. Then the influencing degree of indicators is calculated by DEMATEL(Cui et al. 2019) and the network structure of indicators are constructed. Then,

the weights of indicators are derived by ANP(Farias et al. 2019). Afterwards, mixed weight of each indicator is determined(Tamura and Akazawa 2005). Based on the causality diagram of indicators and weights of indicators, the indicators can be discriminated.

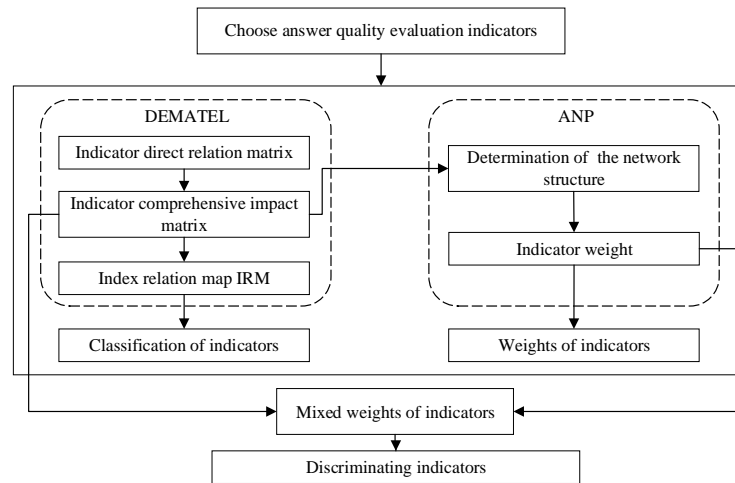


Figure 1. Evaluation process

Evaluation of Indicators

The indicators proposed by Kim and Oh (Fu and Oh 2019) are adopted in the study. The 23 indicators are constructed from content, cognitive, utility, source of information, extrinsic, socio-emotional aspects (Fu and Oh 2019). The contents aspects include eight indicators. The cognitive aspect includes two indicators. The information sources aspect includes two indicators. The socio-emotional aspects include six indicators. The utility aspect includes two indicators. The extrinsic aspect includes three indicators.

Influencing Relationship based on DEMATEL

First, the degree of mutual influence between aspects is calculated based on the filled questionnaires. The obtained direct relation matrix is represented by D , where D_{ij} denotes the degree to which the aspect i affects the aspect j and the values of diagonal elements are set zero. The calculating results of the influence relation between aspects are derived, as shown in Table 1.

Table 1 Direct Relation Matrix D

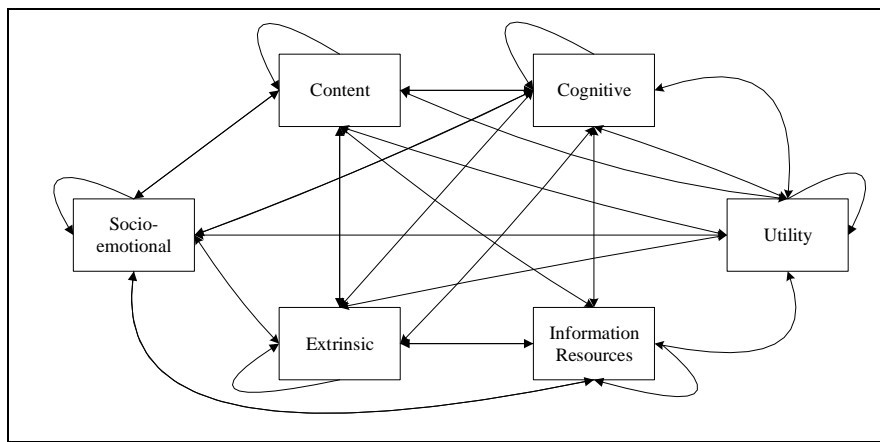
	Content	Cognitive	Utility	Information sources	Extrinsic	Socio-emotional
Content	0.0	2.6	3.5	2.0	2.0	2.4
Cognitive	2.6	0.0	2.2	2.0	1.8	2.4
Utility	2.6	2.8	0.0	2.0	2.6	1.4
Information sources	2.8	1.6	3.0	0.0	2.2	1.0
Extrinsic	1.4	2.4	2.4	2.2	0.0	2.0
Socio-emotional	1.8	1.6	2.8	1.6	1.8	0.0

The relationships with small correlation degree have little influence on the calculation of weights in ANP(Pei et al. 2012). In order to reduce the complexity of influencing graph, the relationships of small correlation degree can be removed. In the study, the threshold is set 0.23 and the relationships whose correlation degree is less than the threshold are removed and the comprehensive influence matrix T is gotten, as shown in Table 2.

Table 2 Comprehensive Impact Matrix T

	Content	Cognitive	Utility	Information sources	Extrinsic	Socio-emotional
Content	0.58964	0.74455	0.90356	0.64684	0.67919	0.63829
Cognitive	0.68462	0.52303	0.76476	0.59174	0.60863	0.58835
Utility	0.70341	0.71291	0.64829	0.61037	0.66978	0.55084
Information sources	0.68643	0.62169	0.79462	0.45888	0.62363	0.50058
Extrinsic	0.59216	0.64146	0.73760	0.57809	0.46767	0.54005
Socio-emotional	0.58205	0.56997	0.72405	0.51762	0.55477	0.38890

As a result, the interaction between aspects can be depicted in Fig.2. The arrow indicate that the aspect has an impact on the other aspect. For example, Socio-emotional points to Extrinsic since Extrinsic has zero impact on Socio-emotional, while Socio-emotional has an effect on Extrinsic of 0.36.

**Figure 2. Impact Diagram**

In the same way, the degree of mutual influence of indicators can be obtained. The indicators are classified into the cause indicators and effect indicators, which are shown in Table 3.

Table 3 Influence and classification of indicators

Cause indicators	Influence	Effect indicators	Influence
Effectiveness	0.55526	Answerer's experience	0.58958
Understandability	0.54588	Reference to external sources	0.56361
Solution feasibility	0.53180	Accuracy	0.56087
Rationality	0.52994	Answerer's effort	0.55162
Completeness	0.51252	Answerer's expertise	0.55048
Objectivity	0.46667	Quickness	0.53375
Available alternatives	0.45902	Agreement	0.52406
External verification	0.44679	Answerer's attitude	0.50460
Writing Style	0.38291	Clarity	0.45124
Taste	0.36585	Specificity	0.39336
Novelty	0.35653	Length	0.39014
		Humor	0.29657

Weights of indicators based on ANP

Firstly, the comprehensive impact relationships between indicators for answer quality evaluation generated by the DEMATEL is input into the ANP (Pei et al. 2012). On the basis of the impact diagram, we select each indicator set, add its sub-indicator element, establish the mutual influence relationship between them and establish a complete network structure diagram. Then we establish the influence relationship of indicators under a certain criterion, select the indicators to be compared, and input the importance degree of the paired comparison to form a judgment matrix. In the judgment matrix, a number greater than 1 indicates that the former indicator is more important than the latter, 1 indicates no difference in importance, and a number less than 1 indicates that the former indicator is less important than the latter.

According to the weight value input by the above judgment matrix, the consistency checking is performed. Then the elements and the criterion to be judged are selected in turn. The judgment matrix is constructed and its weight is determined. The weights of indicators are listed in Table 4.

Table 4 Weights of indicators

Indicators	Weights	Indicators	Weights
Accuracy	0.05345	Reference to external sources	0.07834
Specificity	0.03398	Answerer's expertise	0.05220
Clarity	0.03444	External verification	0.04645
Rationality	0.03749	Available alternatives	0.03093
Completeness	0.02720	Quickness	0.02055
Objectivity	0.02826	Answerer's attitude	0.02285
Writing Style	0.01693	Answerer's effort	0.01470
Length	0.01361	Answerer's experience	0.01979
Novelty	0.15874	Agreement	0.01516
Understandability	0.09061	Taste	0.01047
Effectiveness	0.12401	Humor	0.00974
Solution feasibility	0.06009		

Mixed Weight

Mixed weight is derived by combining the comprehensive impact matrix calculated by DEMATEL and the weight calculated by ANP (Pei et al. 2012; Tamura and Akazawa 2005). The ranking results of normalized mixed weights are in Table 5.

Table 5 Mixed weight of indicators

Indicators	Mixed Weights	Indicators	Mixed Weights
Accuracy	0.06631	Reference to external sources	0.08855
Specificity	0.04132	Answerer's expertise	0.06256
Clarity	0.04495	External verification	0.05622
Rationality	0.04992	Available alternatives	0.04245
Completeness	0.04011	Quickness	0.03185
Objectivity	0.04115	Answerer's attitude	0.03293

Writing Style	0.02612	Answerer's effort	0.02604
Length	0.01984	Answerer's experience	0.03135
Novelty	0.16520	Agreement	0.02558
Understandability	0.10233	Taste	0.01740
Effectiveness	0.13611	Humor	0.01610
Solution feasibility	0.07236		

Evaluation Results Analysis

In the impact relation results derived from DEMATEL, the degrees of causality of Cognitive, Information sources and Socio-emotional are positive, which indicate that the three aspects belong to the casual factor. Therefore, these factors are the active factors and should be given more attention. The degree of causality of Content, Extrinsic and Utility is negative, so these aspects are affected by other factors. Among the secondary indicators, Effectiveness, Understandability, Solution feasibility, Rationality and Completeness are the main cause indicators, and their effect on the importance of answer quality is higher. The quality of website answers can be improved from these cause aspects and indicators.

From the ranking results of importance weights from ANP and the final mix weights, Novelty, Effectiveness, Understandability, Reference to external sources and Solution feasibility occupy the top 5 of all 23 indicators. They are more important factors for the evaluating of answer quality in Q&A sites. These indicators should be in higher priority in selecting the high-quality answer. It is also the reference for guiding the generation of more high-quality answers.

Conclusion

In this paper, the DEMATEL-ANP are used to discriminate the indicators of the quality of answers. The analyzing results show that Cognitive, Information sources, Socio-emotional are the casual aspects, and Novelty, Effectiveness, Understandability, Reference to external sources as well as Solution feasibility are important influencing factors. In order to improve the quality of answers and guide posting more high-quality answer in social Q&A sites, these aspects and indicators should be paid more attention to.

In the future research, more indicators can be used to find more important indicators. The derived weight of indicators can be used to evaluate the quality of answers in famous Q&A sites to verify its feasibility and practicality.

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