A Judgment Model for Academic Content Quality on Social Media

Lei Li*
Department of Information Management
Nanjing University of Science & Technology
No.200 Xiaolingwei Nanjing 210094, China
leili@njust.edu.cn
Advisors: Dr. Chengzhi Zhang & Dr. Daqing He

ABSTRACT
With the emergence of the sharing and acquiring of academic information on social media, the quality of academic information is becoming a critical issue that can have great impact on scholars' desires to engage with social media content. Yet, there is little research on how the quality of academic information on social media should be assessed. My research aims to address this challenge, develop, and test a judgment model for academic content quality on social media. My study on the model consists of a stage of designing a conceptual model and a stage of constructing a computational model. The conceptual model is the basis of the computational model, and it will be studied through a critical review of literature on studies of the quality of user-generated content on social media and the quality of academic content in traditional settings. I will then conduct a mixed-method study to confirm the utility of the conceptual model. In the stage of building a computational model, under the guidance of the conceptual model, I will develop computational procedures and measures for each factor in the conceptual model, and identify the importance of those factors in calculating academic content quality. To demonstrate the feasibility of my project, I will introduce three preliminary studies that I have conducted. These studies focused on ResearchGate's Q&A, one of the largest academic social Q&A sites, to detect the characteristics of academic content, and their results help to shape the process for designing a conceptual model and constructing a computational model. The contributions of my study include facilitating scholars to access high-quality academic content on social web sites, and encouraging more scholars to participate in academic social web to generate more high-quality scholarly related content.

Keywords
Academic social networking sites; quality judgment; quality criteria; peer judgment

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1. INTRODUCTION
More and more scholars have joined in Academic Social Networking Services (ASNSs), such as Academia.edu and ResearchGate, to communicate with others and acquire academic information. ASNSs offer novel interactive possibilities to facilitate collaboration and information access. Before the emergence of ASNSs, scholars shared and interacted on generic social media platforms, such as Facebook, Google+, and Twitter.

Scholars can use social media to access academic resources to support their research. However, the most common way used by scholars to identify high-quality resources is to recognize the peer-reviewed papers published in reputed journals [3]. Social media is another optional way to obtain academic information [1]. However, because social media lack peer-reviewed mechanism, everyone can contribute academic information to it, resulting in a large number of resources with diverse quality (low to high). Thus, it is difficulty for scholars to pick up high-quality information to use, which might be one of the reasons for scholars to not be motivated to join in social media to obtain and share academic resources [2]. However, there are lack of previous works detecting academic information quality on social media. Therefore, academic information quality on social media is a critical issue to be solved.

The issue about information quality has long been studied in literature. Traditional information quality studies focused on information systems, such as Customer Relationship Management (CRM), Knowledge Management (KM), Supply Chain Management (SCM), and Enterprise Resource Management (ERP) [4, 5]. With the popularity of social media, there are concerns about the quality of user-generated content in a social media context. Information in social media are different from information in traditional information systems, with wide audiences, no managers' control, and low barriers to publication [6, 7]. Quality of academic information is different from quality of generic information on social media. Firstly, academic content is more complex with multiple facets and one requires professional or disciplinary knowledge to judge content quality [9]. Moreover, academic information consumers have different professional levels, which may result in different judgment to the same academic content. Academic information contributors and consumers are scholars with their real names and work in higher education, research institutions, or engage in professional work [8]. They are different to the contributors and consumers on the generic information.

Therefore, there may be existing some novel characteristics for judging academic content quality. In addition, information quality studies point out that the quality judgement is affected by various non-content factors, such as product type, demographics, website type, and tasks [10]. Therefore, for academic content quality, novel contextual factors may exist on judging academic content quality, such as the disciplines variance, professional level.

This study aims to understand the conceptual and computational model for accessing academic content's quality in social media. The conceptual model is the basis for building the computational model. By combining information quality judgment frameworks of traditional academic content and user-generated content on social media, the conceptual model is generated for confirming the criteria used by the scholars for judging academic content quality as well as, rankings for these criteria. Also, I would like to understand the kinds of the context that effect judgment of academic content quality. This conceptual framework should be used as a guide for developing academic content computational measurement model for academic content datasets on many different settings. In turn, the conceptual model can be validated by developing specific computational judgment model for various judgment contexts.

Through applying the judgment model for academic content, social media sites are expected to adopt some mechanisms for promoting high content quality to their users. Ultimately, because high-quality content is promoted and made available, more scholars would be willing to join social media to acquire and share academic information, and stimulate the prosperity of the ASNS.

2. RESEARCH QUESTIONS

This study focuses on developing a framework for judgment academic content quality in social media. The research questions can be grouped into two parts.

First, I plan to set up a judgment conceptual model for assessing academic content and comparing it with the generic content quality judgment model. Second, my study will address a way to utilize the model to automatically compute the quality score for each academic content. Based on my research goals and objectives, I propose the following research questions.

Q1 to Q3 are related to the conceptual model.

Q1: What are the judgment criteria of high quality academic content for academic information consumers? What are the ratings of importance for these quality judgment criteria?

Q2: Which contexts can influence the judgment of academic content? How do these contexts affect the importance ratings of the judgment criteria?

Q3: What are the significance differences between the conceptual model for generic content quality and that of academic content quality on social media?

Q4 and Q5 are related to the computational model.

Q4: How can we compute the conceptual model's criteria based on the datasets of the different academic content from generic social media or the ASNSs?

Q5: How can a computational model for predicting academic content quality be designed and constructed? How well can it predict the content quality?

3. BACKGROUND & RELATED WORK

Related literature on academic information quality can be divided into two parts. The first one discusses the information quality of user-generated content on social media. The second part reviews the studies about the traditional academic content quality, such as research papers. These two aspects provide us theoretical basis for detecting academic content quality on social media.

3.1 Information Quality of the User-generated Content in Social Media

There are different types of the communities to which people can contribute, including blogs, microblogs, forums, question and answer platforms, Wikis, rating and review platforms, and media sharing platforms [14] [15]. In the following, we discuss user-generated content quality from the above social media communities.

Blog: To assess the quality of blogs, first, Kargar et al. established a survey on Iranian Blog to formulate the information quality criteria on the blog [16]. Their subsequent works focus on using quality criteria to assess the quality of blog content. Kargar& Azimzadeh proposed blog quality criteria to evaluate the quality of blogs automatically [17]. Chen & Ohta measured the topic concentration and topic variety to exam the quality of blog from the content depth and content breadth [18]. Chuenchom found that the context factors including gender, education level, age, profession, purpose of use, and specific interests affect the criteria used for evaluating the quality of blogs [19].

Microblog: We know that microblogging is a shorter version of blogging, and it is a more concise, focused version. Accessing microblog content is a recent research topic. Becker et al. use centrality-based techniques to select twitter messages with high textual quality [21]. Peng et al. used multiple features fusion to extract high quality microblog [20]. They confirmed that query-reply results on microblogging platforms outperformed other methods, by extracting high quality information from microblogs [22].

Discussion forum: Most previous works for information quality assessment on discussion forums were concentrated on online learning discussion forums. Many previous works put forward different models to assess different kinds of online learning discussion forums [23, 24, 26, 27]. For example, Newman et al. based on Garrison's [25] 5-stage critical thinking model: 1) identification, 2) definition, 3) exploration, 4) evaluation, and 5) integration to identify 10 criteria of evaluating the quality of learning online [23]. Savolainen researched on the generic discussion forums, and provided the criteria that are for judging the quality of the message's information content and the credibility of information provider by concentrating on two discussion topics: use of natural products and issues of racism. The criteria were identified from positive and negative views [28].

Social Q&A: there are plenty of works on the quality of the answers on the social Q&A platforms, such as Yahoo! Answers. For examples, Agichtein et al. used intrinsic content features, user relationship, usage features to automatically identify high quality answers on Yahoo! Answers [29]. Kim & Oh analyzed the comments provided by questioners on Yahoo! Answers , and categorized the criteria used by questioners to choose the best answers. They found that the solution feasibility, completeness, and agreement of the answer were the top-3 important criteria used by the questioners to evaluate answers. Fu et al. considered textual and non-text features of answers to identify useful features for

evaluating high quality answers across four knowledge domains: science, technology, art, and recreation [31].

Wikipedia: The quality of articles is one of the main concerns of Wikipedia contributions, mainly because of the non-expert peer review mechanism and open edited nature of Wikipedia. Several measures have been proposed to evaluate the quality of Wikipedia articles. Some are based on the history of the article, such as the total number of edits, and the reputation of the editors to evaluate [32, 34]. Stvilia et al. analyzed the Wikipedia articles discussion pages. Information quality problems encountered in the Wikipedia were identified [33]. Then, they also presented a general information quality evaluation model, and this model was used for judging the Wikipedia articles [35]. Yaari et al. employed sixty-four users to assess the quality of five article from the Wikipedia and explain the judgment reasons [36].

Review: Existing studies on the review quality are concentrated on products review quality, helpfulness, usefulness or utility assessment, such as on Amazon.com. Most of the previous works focused on verifying the quantitative factors of product review, including the characteristics of reviewer, such as reviewer experience, reviewer impact, and reviewer cumulative helpfulness [37] [39] [40], review length [38] [40] [41] [42], which impact on review helpfulness. There are few studies examining the qualitative factors that affect the review quality. Chua & Banerjee studied the relationship between the information quality and the users' perceptions of review usefulness. Tsaparas et al. proposed an algorithm that can select a comprehensive set of few high-quality reviews that cover many different aspects of the reviewed item, in order to deal with the information overload of the user-generated reviews.

Media sharing platform: Media sharing platforms support users to upload media content (e.g. picture, video) and share it with the public. The two famous media sharing platforms are Flickr and YouTube, on which users can upload images and video, respectively. For image quality assessment, the earliest studies are from the purely physical properties of image content to evaluate the image quality [46]. Then depending on the reference image, full-reference (FR) IQA, reduced-reference (RR) IQA and no-reference (NR) IQA algorithms were proposed [44, 45, 47, 48]. With the emergence of user-generated images (UGIs), Chua and Banerjee [54] presented using the pictures' tags and comments, social links to predict the images quality. For video quality assessment, existing studies include full-reference (FR) IQA, reduced-reference (RR) IQA and no-reference (NR) visual quality assessments to evaluate the video quality [50-53]. Because of the new environment of social media, Zhu et al. investigated the relationships between social context, user factors and some media technical properties (e.g. bitrate level and video genre) [49].

There is a wealth of quality assessment studies for each user-generated content. Because each type of user-generated content has its own unique characteristics, it needs to be applied to its own quality assessment model. Therefore, academic user-generated content also need quality judgement model per its characteristics. However, there are lack of studies on academic information quality on social media. The quality judgement models of each user-generated content from the previous studies will provide theoretical supports and references for this research.

3.2 Academic Content Quality

Traditional academic content are research papers. Previous research states that high quality journals are more likely to publish high quality research papers. Hence, previous works focus on detecting the high-quality journals, such as analyzing journals' citation, impact factor, reputation [55, 56]. Then other researches argued that though the journals' quality evaluation methods to judge the article quality have the bias [57, 58]. Furthermore, the concept of quality is context-based. Different information consumers in the particu7lar context have different quality criteria. The following studies directly based on the papers' external features to judge the quality, such as using papers' authors reputation and citation [59, 60]. Following works detected into the papers' content and judgement context to explore the papers' quality. Calvert and Zengzhi presented the most accepted criteria given by the journal editors for evaluating research articles, including new information or data, acceptable research design, level of scholarship, advancement of knowledge, theoretical soundness, appropriate methodology and analysis [61]. Clyde detected the influence of the evaluators' specialist knowledge on the research publications' quality judgement [62].

Until now there are no previous works on the quality of academic content on social media. However, some works have studied the user perception of relevance and credibility of academic information. Meanwhile, some researchers consider relevance and credibility of information as aspects of information quality [63, 64]. Therefore, this proposal also summarizes these studies about the relevance and credibility judgments of academic information.

On the relevance judgement studies, there are some works that explore relevance judgement criteria. For examples, Park interviewed 11 graduate students to evaluate the bibliographic citations for their research proposal of masters' thesis [83]. They identified three major categories, including internal context, external context, and problem context, of affecting relevance assessments [66]. Cool reported humanities scholar's judgements criteria of texts for a variety of tasks from teaching to research [65]. Barry collected 18 academic users' relevance criteria to evaluate the text of documents. They identified 23 categories in seven groups [67]. Vakkari studies the change of relevance judgements of 11 students on preparing a research proposal for the master's thesis. They observed that changes of the students' relevance criteria on retrieved references and documents changed during their work process [68].

Open access publications and virtual social media academic sources give scholars a new way to get resources. So the credibility of academic information studies is another related topic. Rieh reports the cognitive authority by observing the scholars' searching behavior on the web for four tasks, including research, travel, medicine, and computer tasks [71]. Liu investigated the features that influence students' perceived believability of scholarly information on the web through the questionnaire [70]. Currie et al. determined the criteria that undergraduate students use to find credible citations for their research papers [69]. Watson examined the relevance and reliability criteria applied to information by 37 students for their research assignments or projects. The identified criteria were classified into two major categories, pre-access criteria and post-access criteria [63]. Tenopir et al. found that researchers are lack of trustworthiness of social media as a channel for research information, because of doubting about the quality of information [72].

The above studies that have been carried on information quality on social media and academic content quality provide foundations to set up the conceptual model presented in this research.

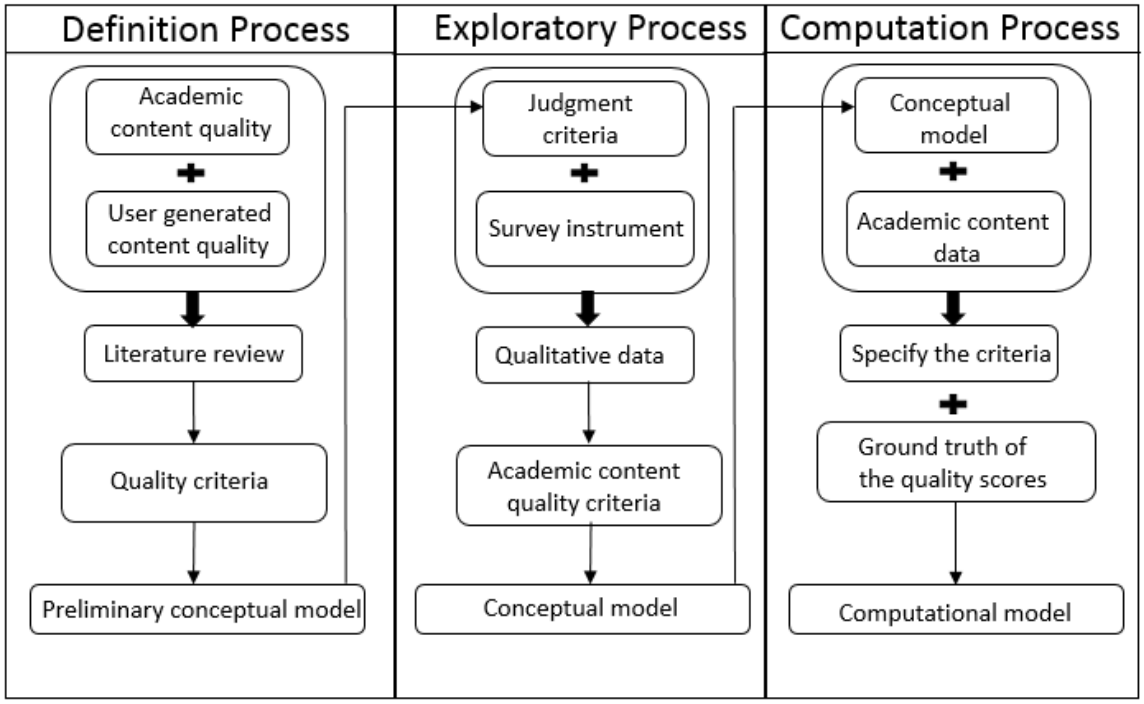

Figure 1. The overall research plans

4. WORK PLAN

My dissertation study involves three processes: a definition process, an exploratory process, and a computation process. The definition process assists in building the preliminary concept model based on the related studies, while the exploratory process validates the preliminary concept model against newly environment and the computation process is for applying the concept model to the gathered academic content data. The overall research plan is descripted in the Figure 1.

4.1 Definition Process

The definition process aims to define the preliminary concept model by summarizing the criteria of information quality from previous works. To gain a targeted view of academic content quality, I examined the prior studies of user-generated content quality and academic content quality to set up the preliminary concept model. I need to identify criteria related to the content and the context factors that influence quality judgment.

4.2 Exploratory Process

Based on the preliminary concept model, I will use an exploratory process to identify criteria that academic information consumers use to perceive if the criteria fit their usage [12]. Hence, this process will include a survey to make sure I use the appropriate criteria and their weight. I will complete the concept model by introducing novel criteria that are suitable for academic content quality judgment. Finally, this will result in a concept model that specifies quality judgment of academic content. After finishing this process, I will be able to answer the research question Q1-Q3.

4.3 Computation Process

The computation process aims to validate the conceptual model by using academic content data, which is collected from social media or ASNSs. Because each platform has its personalized characteristics, this process should specify criterion to apply to specific datasets, such as academic question / answer and academic blog. Meanwhile, I will employ scholars to judge academic content quality, and then use the judged datasets to identify which criteria preform best to predict academic content quality. This process will be used for answering the research question Q4 and Q5. Table 1 summaries the methods, inputs and outputs of each step.

5. PRELIMINARY WORK

In this section, I summary preliminary work done related to my research topic. These preliminary works focus on one of the ASNSs, ResearchGate's Q&A platform, to detect academic answers' characteristics.

5.1 Information Exchange on ResearchGate Q&A

I conducted a study about the kinds of information scholars exchange while asking and answering academic questions on ResearchGate Q&A platform. I performed content analysis and statistical analysis on the collected 107 questions with 1021 answers across three disciplines: Library and Information Services, History of Art, and Astrophysics. From the questioner's intentions, content features, social cues, consensus building and the provided resources types, I analyzed characteristics of the questions and answers, and compared the three disciplines. Initial results confirm that the characteristics of the three disciplines' academic content have the similarities and differences, which give me the foundation on distinguishing the disciplines based on research on academic content quality. For more detail information about this study, please check my paper [11].

Table 1. Methods, inputs and outputs of each steps

Processes	Methods	Inputs	Outputs
Definition process	Literature review	The quality judgment frameworks about the user-generated content quality on social media; The quality judgment frameworks about academic content quality	Judgment criteria related to the content; Judgment criteria related to the context
Exploratory process	Survey; content analysis	The definition process identified judgment criteria related to the content and context	The criteria used for academic content and these criteria's importance ranking
Computation process	Supervised learning	Academic content dataset; conceptual model; the ground truth of academic content quality scores	The predicted quality score for each academic content

5.2 Academic Answer Quality Characteristics and Prediction on ResearchGate Q&A

This work I also used the 1021 answers we collected from the ResearchGate Q&A platform. I explored the influence of the web-captured features and human-coded features on the peer-judged answer quality. The peer-judged answer quality score is defined by the votes received from other users on ResearchGate Q&A. Then I also used the web-captured features and human-coded features to predict the answer quality scores by applying the Naive Bayes model, SVM model and multiple regression model. This work found that academic answer quality is characterized differently from general Q&A sites. However, this study did not distinguish the different disciplines to deeply detect this question. In the future, we will enlarge the datasets and test on the other social media platforms. Please check our paper [8] to acquire the more information of this study.

5.3 Judgment Criteria of High Quality Academic Answers

This study explored the criteria used by the researchers to judge academic answers' quality. I employed 15 PhD students of Library and Information Science (LIS) domains to judge the 157 answers we collected from the ResearchGate Q&A. The participators were requested to rate the quality of the answers and reported the criteria for judging, and ranked three most important criteria. This study identified the criteria used for judging academic answer quality, but not mentioned for judging the generic answer quality. And I also identified the important criteria for judging the high-quality answers. These findings also demonstrate the difference between the criteria for assessing high quality academic answers and those for generic answers. This work has not been published yet.

The above three preliminary studies just concentrate on ResearchGate Q&A to detect academic content quality. My dissertation study proposes to set up a general academic information quality judgment model, and then use it to the specific context to compute the quality score.

6. SIGNIFICANCE

Although more and more scholars desire to use social media to share academic information and communicate with other scholars, content quality is a significant issue that hinders scholars' from acquiring reliable academic information through social media. So, my work wants to solve this issue to benefit the ASNSs and scholars.

ASNSs: Tenopir et al. and Watkinson et al. confirmed that many scholars do not trust academic information on social media and join in the ASNSs frequently, because of the lack of the peer-reviewed [1, 13]. So, by applying the judgment model for academic content, the ASNSs can filter the low-quality content and recommend the high-quality content to satisfy the information consumers. The usage of the ASNSs could be promoted.

Scholars: The scholars who join in social media can acquire academic information which are recentness and provided fast, compared with getting academic information from the journal which need a long time to publish. Moreover, the information on social media has global audiences, which can extend knowledge creation to stimulate the thinking. Social media provide the scholars a more direct way to communicate with other scholars.

7. CONCLUSION

This proposal puts forward processes about how to build and test a conceptual model and a computational model for judging the quality of academic content on social media. To demonstrate the feasibility of my proposal, I conducted three preliminary studies, including detecting the characteristics of information exchanged on ResearchGate Q&A site, exploring the factors that influence the peer-judged high-quality academic answers, and the judgment criteria used for judging academic answers. I believe that my project will have a great significance to improve users' satisfactions with academic content on social media.

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