

User Perceived Quality of Online Social Information Services: From the Perspective of Knowledge Management

Y. S. Dai¹, Q. Gao¹, Z. Fan¹, R. G. Kang²

¹Department of Industrial Engineering, Tsinghua University, Beijing, China

²Department of Automobile Engineering, Tsinghua University, Beijing, China

Abstract – Features of emerging online social information services show promises for overcoming obstacles in knowledge management practices. This paper first discussed the potential efficacy and emerging practices of such technologies in the domain of knowledge management. Then a quality model of online social information systems was derived from prior literature on online information service quality and analyses of characteristics of emerging technologies. An online questionnaire was developed and administrated to 168 users of online social information service. Four quality dimensions that are perceived as important by users were identified by factor analysis and proved to be reliable: system usability, content quality, content exchangeability and accessibility, and sociability. The findings of this research provide implications for developers of both enterprise knowledge management systems and public social websites, and can facilitate future development of the instrument measuring the quality of online social service from other perspectives.

Keywords - Knowledge management, online service quality, online social information services, web 2.0

I. INTRODUCTION

A knowledge management (KM) system is to capture, store, and distribute knowledge throughout an enterprise. Despite the large investment into sophisticated technical systems, however, attempts in this direction have been less fruitful as expected. Many attribute these experiences to the conflict between the tacit nature of much knowledge and the requirement of explicitness of digital systems. Knowledge resides not only in structured format, but also in informal or tacit forms in human's head. Thus how to extract knowledge from people is challenging, especially when collaborative efforts are required. Traditional knowledge acquisition suffers from narrow bandwidth (limited resources), acquisition latency, knowledge inaccuracy, and maintenance trap [1]. Another imperative is to provide a ubiquitous platform for integrating distributed content in different formats residing in different applications. The third challenge is to facilitate effective retrieval from the huge and ever growing knowledge repository of an enterprise.

A. Online Social Information Services and KM

Recently online social technologies are coming into wide usage under the name of Web 2.0 wave. While many

criticized that Web 2.0 is hype or a buzzword, these emerging technologies, including blog, wikis, social networking services, and media sharing services, share certain features which distinguish them from Web 1.0 applications and are promising in overcoming obstacles to effective knowledge management. They are lightweight, easy to use and flexible, with the capability to capture knowledge in a shared, growing repository; they are widely accessible through web, and well suited for integrating distributed contents and applications; they facilitate communications and collaborations which are critical for tacit knowledge capturing; and most importantly, they facilitate a decentralized knowledge sharing model, which motivates knowledge workers to participate and contribute. It is human who processes data to information and finally to knowledge, as stated by Stantous and Surmacz [2], "while KM is often facilitated by IT, technology itself is not KM."

There are emerging attempts to explore the potential of online social technologies to support KM. Wagner [1] introduced wiki as software that enable conversational knowledge acquisition (so-called *Bazaar* style), and provided evidence for the feasibility and effectiveness of this approach by empirically analyzing the famous wiki system - Wikipedia (<http://www.wikipedia.org>); Coenen and his colleague [3] discussed the architecture, usage pattern, and applications of social networking systems in regard to knowledge sharing competency, and implemented the discussed results in an open source KnoSoS system (the system is available to test at <http://www.knosos.be>); Ahn, Brusilovsky, and Farzan [4] designed and implemented a social search system based on a social adaptive navigation system Knowledge Sea and found meaningful changes in user behaviors as time passes and use experience accumulates; Grudin [5] proposed unstructured tagging and weblogs, together with effective search tools, as possible solutions to KM logjams encountered by today's enterprises.

These emerging technologies, no matter how promising, will be useless if users do not want to use them. To build systems supportive rather than obstructive to knowledge workers, it is important to identify quality dimensions that users adopt to assess such services. The purpose of this study is to such dimensions from a perspective knowledge management.

B. Quality Dimensions of Online Services

A remarkable body of research has been conducted to investigate online service qualities, yet there is still confusion of what online service quality is. This can be attributed to the different domains online services belong to, which lead to different sets of quality dimensions of online services only meaningful in the context of a certain targeted industry. E-commerce websites draw the most attention [6-9], and others include portal sites [10-12], online travel agencies [13], academic websites [14], personal websites [15], and etc. Prior research developed some fundamental knowledge about online information service quality. However, few scholarly studies, to date, have been undertaken to identify quality dimensions and detailed aspects of online social information services.

II. CONCEPTUAL FRAMEWORK

We based our framework on the technology adoption model (TAM) [16] which has been widely applied to the Internet and WWW. It posits that the actual use of a technology can be predicted by users' behavioral intention and his/her attitude towards use, and in turn are influenced by perceived usefulness and ease of use. The question is: what aspects of "usefulness" and "ease of use" of online social services do users expect in terms of knowledge management?

There are two underlying assumptions for developing the quality framework for online social information systems. First, these services inevitably share some common characteristics with other online information services; second, these services differ from other online information services in their architecture of participation and sharing. Therefore, based on a comprehensive review of literature on other online services quality and analyses of "social" functionalities of these services, we identified four quality dimensions of online social systems from the perspective of knowledge management (shown in Fig. 1):

1) System usability: as to any information systems, usability is important to increase the revisit of users for online social services. Users should feel the system "friendly", easy to use, and under control. Lin et al [17] proposed eight usability criteria of usability from the perspective of human information processing: *compatibility, consistency, flexibility, learnability, minimal action, minimal memory load, perceptual limitation, and user guidance*. In the context of online social services, where customized avatars, messages, and other contents are so common that the feature nearly becomes essential, *customization* is also included in this dimension.

2) Content exchangeability and accessibility: the architecture of participation bases these online social services, which also motive effective knowledge sharing. To achieve this purpose, user-generated information, in various formats, should be able to be easily and quickly published, searched and retrieved. This dimension mainly consists of variables related to information accessibility, responsiveness, and searchability. In addition,

"subscribability" via RSS/ATOM is considered an important for users to get alerts of information alerts and also included. Thus the variables are: *information availability, visiting speed, upload speed, download speed, search function enabled, search speed, amount of search result, relevance of search results, and subscribability*.

3) Content quality: content is to the central of all online information services, and prior research repeatedly stressed the importance of content/information quality to perceived benefits from websites, user satisfaction and the level of system usage. *Accuracy, relevancy, timeliness, and adequacy* of content are variables shared by general online information services and are meaningful to online social services as well, whereas following variables are considered especially important or specific to the user-autonomy and decentralization nature of online social services: *information uniqueness, privacy protection, and censorship against illegal content*.

4) Sociability: the degree to which an online service can support social interaction, or so-called "sociability", is a determinant to the success of online communities, and it plays a more important role in these explicitly "social" services. Since this dimension is less studied and defined than the others, we developed our variables upon a review of social presence theory, online relationship studies, and analyses of sociable behaviors of current online social service users. They are *sharing and editing capability* (whether users are able to share content such as articles, graphics, audios, and videos with peer users), *commenting capability* (whether users can comment on others' content), *relating capability* (whether information from various users and various sources can be related to form an organic network, for example, via tagging, trackbacking, user recommendations), *social interactions support* (whether a website can support social interactions among users and help form relationships), *collaboration support* (whether a website can support collaborative working), *self-presence* (how successfully users can use the service to convey a sense of real, rather than 'virtual', presence), and *social influencing capability* (whether users can exert social impacts by attaining powers, reputations, or authorities on the website).

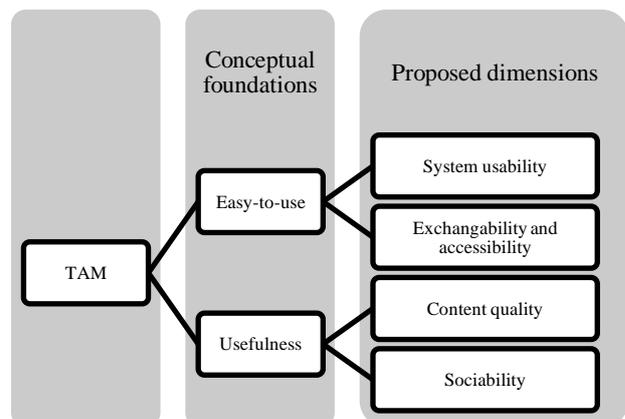


Fig. 1. Quality model of online social information services

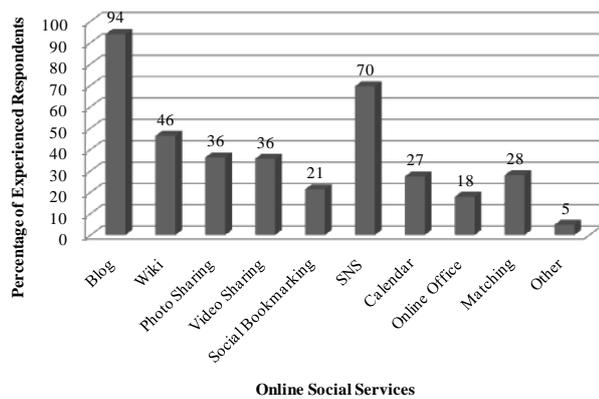


Fig. 2. Respondents' Experiences with Online Social Services

III. METHODOLOGY

A. Instrument Development

Based on examination of prior work on similar services and analyses of online social information services, an initial pool of 52 items was developed. These items are firstly examined by the author according to correlation between items and their centrality to quality of online social information services, with regards to knowledge knowing. Then critiques of items were sought from 3 undergraduate students who were familiar with the project and experienced in online social networking services. They were given the description of the problem and were asked to review the questionnaire for validity (measuring what is intended), completeness (including all relevant variable items), readability, and other problems in overall questionnaire design. Several items were deleted, and word modifications were made according to the critiques.

Then the questionnaire draft was distributed to six undergraduate students, majoring industrial engineering to find if there were items not descriptive enough and if there were any other difficulties they had during answering the question. The feedback received was incorporated by revising the scale again, yielding a list of 32 items as the final version of the instrument. Items were worded as "how important is this characteristic to you regarding your decision on use of an online social information system?" All were measured by using a 7-point Likert scales anchored by "1" as "completely unimportant" to "7" being "completely important." Demographic variables (age, sex, education level, occupations, and the level of income) and experiences with computer use, internet use, and online social services use were included also.

B. Data Collection and Sample Profile

The final version of the scale was administrated online. Recruitment was carried out by posting on the BBS of Universities and on online forums discussing online social services, sending invitation letters to

students to 2 selected departments in Tsinghua University, and contacting with users of Xiaonei (<http://www.xiaonei.net>), one of the largest online social networking services for college students in China). Respondents were required to be experienced with at least one type of online social services and to indicate it. As an incentive, two prizes, each as 100 RMB Yuan, were set up. After the data collection, two respondents were randomly selected from those who provided valid responses and rewarded. 225 responses were collected within two weeks, among which 168 were valid.

113 percent of the respondents were male (67%) and 55 were females (37%); respondents age from 16 to 37, averagely 21 years old; 82% were undergraduate students, and 16% had higher education; 52% majored in engineering, 24% in science, and 24% in art. As shown in Fig. 2, 94% were blog users and 70 had experience with social networking services (SNS). 66.7% had such experience for more than one year, and 82 reported that they use such services at least once per week. 61% had a positive attitude towards such services, 36% holding a neutral attitude, leaving only 3% reporting a negative attitude.

IV. DATA ANALYSIS AND RESULTS

To identify major quality dimensions of online social information services, a principal component factor analysis with a varimax rotation was conducted. Before that, the Kaiser-Meyer-Olkin (KMO) was computed for the sample, and the result was 0.8, meaning that factor analysis can be used to extract research dimensions. Four factors which were evident on the Scree plot and had an eigenvalue larger than 1 were extracted. Comrey [18] indicated that factor loadings larger than 0.45 could be considered fair, and greater than 0.55 good. Here we adopted 0.45 as the cut-off value. Items that did not load strongly on any factors (loading smaller than 0.45) or items that had cross-loadings were deleted. 2 items were deleted, and the remaining 30 items were again factor analyzed. Each item was found to load strongly on only one factor. As shown in TABLE 1, four factors were generated, labled as *system usability*, *content quality*, *ease of information transfer*, and *socialbility*; they accounted for 47.0% of the variance. The factor loading pattern was to a large extent consistent with the proposed quality model, except for the variable *subscribability*. It loaded on *system usability* very well (loading = 0.62) rather than *ease of information transfer* as proposed.

The Cronbach α coefficient was computed for each extracted factor as a measure of internal consistency. The result showed that the smallest value was 0.78, well above the normal acceptance level ($\alpha = 0.60$). Consequently, these factors provide a reliable and consistent measure of quality dimensions and no further elimination of variables appears necessary.

TABLE I
FACTORS, EXPLAINED VARIANCE, ITEMS, LOADINGS, AND α VALUES

Factors	Items	Loadings	α
System Usability (explained variance = 4.1)	Subscribability	0.619	0.83
	Compatibility	0.698	
	Consistency	0.630	
	Flexibility	0.511	
	Customizability	0.619	
	Learnability	0.639	
	Minimum memory load	0.563	
	Perceptual limitation	0.526	
	Minimum action	0.568	
	User guidance	0.487	
Content Quality (explained variance = 3.6)	Accuracy	0.603	0.80
	Relevance	0.631	
	Timeliness	0.752	
	Adequacy	0.590	
	Privacy protection	0.581	
Content exchangeability and accessibility (explained variance = 3.3)	Censorship against illegal content	0.532	0.79
	Information availability	0.534	
	Visiting speed	0.666	
	Upload speed	0.605	
	Download speed	0.700	
	Search function enabled	0.546	
	Search speed	0.715	
	Amount of search results	0.527	
	Accuracy of search results	0.572	
	Relating capability	0.468	
Sociability (explained variance = 3.1)	Social interactions support	0.801	0.78
	Collaboration support	0.509	
	Commenting capability	0.735	
	Self-presence	0.777	
	Social influencing capability	0.622	

System usability accounted for 14% of total variance. For online social information services whose content generation is based upon active participation and frequent usage of users, whether users feel it is easy to operate is critical. This dimension had 10 items, 8 from the usability index proposed by Lin et al. [17] plus *customization* and *subscribability*. *Content quality* explained 12% variance. It measured not only whether the information is correct, up-to-date, and completed, but also whether the information is checked for illegal content before published to all users and whether users' private information and content is protected. *Content exchangeability and accessibility* accounted for 11% of total variance. It measured whether contents are accessible and whether contents can be found, visited, and downloaded easily and fast. The fourth dimension, *sociability*, represented 10% of total variance. It measured

whether users can build social presence, interact with others, develop relationships and exert social influences in virtual communities. The small differences in explained variances indicated that these dimensions do not differ a lot in importance ratings.

V. DISCUSSION

According to our study, quality of online social information services perceived by users as important to their decision to use is related to four major factors: system usability, content quality, content accessibility, and sociability. To deploy online social information systems for knowledge sharing in enterprises, these factors should be taken into consideration.

First, the mean scores of *content accessibility* dimension and *content quality* dimension are quite high (5.8), whereas *sociability*, a more recognized feature for such services, has a score of 5.2. This may indicate that "content" is perceived central to online social services. Users come to such online services for good content generated or recommended by others, and expect it is easy to find and fast to download. Especially, the rating of *accuracy of search results* was above 6. To improve accuracy of search results, using user-generated metadata to help determine relevance of results may be a possible solution. Collaborative tagging has proved to be successful in engaging users in online information management by its highly social and interactive characteristics. There is potential for extracting and capturing tacit knowledge from professionals in enterprises with such social tagging systems, and for supporting social navigation [19-20]. However, as Scott Golder and Bernardo Huberman [21] pointed out, there are numerous problems to overcome, including polysemy (one word with different meanings), homonymy (one word with unrelated meanings), and synonymy (people applying different terms to the same object).

The high rating of *content quality* implies that enterprises and web developers should actively seek ways to improve the content quality. Given the autonomous nature of such services, promoting the quality of content on such websites needs not only censoring mechanism against illegal content but also a culture of innovation and contribution.

To foster such a culture, both usability and sociability of the online social system should be improved. They were found key factors influencing participation and contributions in online communities [22]. Whereas endeavors to improve usability can be started from intensive prior research and guidelines, creativity is required to improve sociability of a website. Tools are required to help users build shared sense of identity and purpose, to develop continuous relationships among users, and to encourage community knowledge building and distributing.

The primary limitation of this study is the context where the data were collected. Given the fact that few, if

any, companies in China have attempted to adopt such technologies in their KM systems, we found it extremely difficult to conduct the study in the context of enterprises. Data were gathered in the context of public online social services, which is different from enterprise information systems in terms of both information proprietary and the hierarchy of social relationships. In addition, respondents were most college students rather than company employees, since they are the most active players on social websites. The difference in social roles may lead to different usage pattern and requirements, and different perceptions of quality as well.

VI. CONCLUSION

This paper first discussed the potential efficacy of online social information systems in the domain of knowledge management. Then quality dimensions of online social information services were built upon TAM. The quality model was tested and the results showed the developed instrument is fairly consistent with proposed model, and the internal consistency of the instrument is acceptable.

Despite the limitations resulted from the context of data collection and the sample, the research provides some valuable findings for developers of both enterprise KM systems and public social websites by identifying four factors influencing perceived quality from user: system usability, content quality, content exchangeability and accessibility, and sociability. It also contributes to future development of instrument measuring quality of online social information systems from other perspectives..

REFERENCES

- [1] C. Wagner, "Breaking the knowledge acquisition bottleneck through conversational knowledge management," *Information Resources Management Journal*, vol. 19, pp. 70-83, 2006.
- [2] M. Santosus and J. Surmacz, "The ABCs of Knowledge Management," in *CIO Magazine online*, 2005.
- [3] T. Coenen, D. Kenis, D. C. Van, and E. Matthys, "Knowledge sharing over social networking systems: architecture, usage patterns and their application," in *OTM Workshops 2006*, OTM Workshops 2006, R. Meersman and Z. H. Tari, Eds.: Springer-Verlag, 2006, pp. 189-198.
- [4] J. Ahn, P. Brusilovsky, and R. Farzan, "Investigating Users' Needs and Behavior for Social Search," in *Proceedings of Workshop on New Technologies for Personalized Information Access (PIA 2005)*, Proceedings of Workshop on New Technologies for Personalized Information Access (PIA 2005), 2005.
- [5] J. Grudin, "Enterprise Knowledge Management and Emerging Technologies," *Proceedings of the 39th Annual Hawaii International Conference on System Sciences*, vol. 3, pp. 57.1, 2006.
- [6] J. C. Lam and M. K. Lee, "A model of Internet consumer satisfaction: Focusing on the Web-site design," *Proc. 5th Amer. Conf. Inform. Systems*, pp. 526 - 528, 1999.
- [7] Z. Yang and X. Fang, "Online service quality dimensions and their relationships with satisfaction," *International Journal of Service Industry Management*, vol. 15, pp. 302-26, 2004.
- [8] C. Liu and K. P. Arnett, "Exploring the factors associated with Web site success in the context of electronic commerce," *Information and Management*, vol. 38, pp. 23-33, 2000.
- [9] X. Zhang, K. B. Keeling, and R. J. Pavur, "Information quality of commercial web site home pages: an explorative analysis," *Proceedings of the twenty first international conference on Information systems*, pp. 164-175, 2000.
- [10] C. S. Lin and S. Wu, "Exploring the impact of online service quality on portal site usage," *System Sciences, 2002. HICSS. Proceedings of the 35th Annual Hawaii International Conference on*, pp. 2654-2661, 2002.
- [11] Z. Yang, S. Cai, Z. Zhou, and N. Zhou, "Development and validation of an instrument to measure user perceived service quality of information presenting web portals," *Information and Management*, vol. 42, pp. 575-589, 2005.
- [12] R. A. van, "Exploring consumer evaluations of e-services: a portal site Allard CR van Riel, Veronica Liljander, Petra Jurri'ns The Authors," *International Journal of Service Industry Management*, vol. 12, pp. 359-377, 2001.
- [13] S. A. Kaynama and C. I. Black, "A proposal to assess the service quality of online travel agencies: an exploratory study," *Journal of Professional Services Marketing*, vol. 21, pp. 63-88, 2000.
- [14] L. Olsina, D. Godoy, G. J. Lafuente, and G. Rossi, "Specifying Quality Characteristics and Attributes for Websites," *Proceedings of the First ICSE Workshop on web Engineering*, pp. 16-17, 1999.
- [15] P. Katerattanakul and K. Siau, "Measuring information quality of web sites: development of an instrument," *International Conference on Information Systems*, pp. 279-285, 1999.
- [16] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly*, vol. 13, pp. 319-340, 1989.
- [17] H. A. LIN, Y. Y. Choong, and G. Salvendy, "A proposed index of usability: a method for comparing the relative usability of different software systems," *Behaviour & Information Technology*, vol. 16, pp. 267-277, 1997.
- [18] A. L. Comrey, *A first course in factor analysis*. New York: Academic Press, 1973.
- [19] D. Millen and J. Feinberg, "Using Social Tagging to Improve Social Navigation," presented at *Workshop on the Social Navigation and Community based Adaptation Technologies*, 2006.
- [20] M. A. Storey, I. Bull, and P. Rigby, "Waypointing and social tagging to support program navigation," *Conference on Human Factors in Computing Systems*, pp. 1367-1372, 2006.
- [21] S. Golder and B. A. Huberman, "The Structure of Collaborative Tagging Systems," *Information Dynamics Lab, HP Labs, Technical report 2005*.
- [22] N. Lambropoulos, "Sociability and Usability for Contribution based on Situated Informal Learning and Consensus Knowledge Building in Online Communities," *Online Communities Panel Discussion organized by Dr Jenny Preece, in the Proceedings of the 1st Conference on Usability and Internationalization, in the 11th International Conference on Human-Computer Interaction*, pp. 22-27, 2005.