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Advertisement Placement in Online Knowledge: The Effect of Advertisement Placement on Perceived Information Quality and Reuse of Online Q&A Services.

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ABSTRACT

This study aimed to investigate the importance of managing perceived information quality in open knowledge sharing Q&A services. Especially, advertisement placement inside information is examined whether it has the effect on changing users' perceived information quality, satisfaction, and behavior intention. One of the Q&A samples was randomly shown to the respondents, and their perceptions were surveyed. With a structured equation model and ANOVA test the data were analyzed. The results explain the effect that advertising information may bring about and also the results show that the individual perception on the additional advertisement placement may vary depending on the characteristics of information topics. In addition, this study implies the particular needs on controlling the advertisement placement inside the information of everyday topics and on managing. These results extend the understanding of the advertisement placement inside information of open knowledge sharing services and guide online information service managers to manage their information with more care placed on advertisement placement so as to increase user satisfaction and behavior intention.

Keywords

Q&A Service, Open Knowledge Sharing Service, Advertisement Placement inside Information, Perceived Information Quality

INTRODUCTION

As information created by crowds, sometimes non-expert users, is increasingly shared and spread, acquiring qualified information that can be knowledge is a major challenge for online knowledge-sharing services (Spink & Ozmultu, 2002). One relatively recent form of online knowledge sharing services is Question and Answer (Q&A) services. As the services provide an easy way for any users to ask questions of any topic and for any other users who know answers to provide the answers, knowledge and expertise have been transferred successfully through the Q&A services (Harper et al., 2008). In 2002, Naver (http://www.naver.com), a South Korean internet portal, developed a Q&A community service called "*Knowledge IN*", which allows users to ask questions for anyone who knows the answers, and the service has turned out to be successful. Similar sites are now common worldwide: Yahoo! Answers localized in 26 countries with 120 million users in 2007, Google Answers in China and Russia, and Daum Knowledge and Nate Knowledge in South Korea (Leibenluft, 2007). Most of the services set their aims on providing answers with fast, reliable, and trustworthy results (such as Ask.com; Naver Knowledge In; Daum Knowledge). Since answers are the main data, contents, products, and service per se of those Q&A services, the importance of the quality of the answers has been emphasized. For this reason, there have been many quality analyses on Q&A services. Janes, Hill, and Rolfe (2001) analyzed 20 American Q&A services to see the quality of answers. Park and Jeong (2004) empirically studied the efficiency and effectiveness of answers in Q&A services. Harper et al. (2008) compared responses provided across several online Q&A sites and found out the predictors of answer quality.

Although there have been a large number of studies about the absolute quality of information in Q&A services, few studies focused on the perspective of users' perception. Because users' perception on products or services is the key point of users' overall satisfaction and reuse of services, it is important to study how we can improve users' perception on products or services that companies provide (Jin, 2005). Therefore, in Q&A services, it is necessary to find factors affecting users' perception on information quality to increase users' satisfaction and reuse rate. Among the factors affecting users' perception on answer quality, we focused on the advertisement placement in the answers. It is because according to several marketing researches users responded that advertisement placement in Q&A services distract them from finding answers of quality: in the research of NHN knowledge service team (2004), 17% of users pointed out that they are distracted by advertisement placement in answers; in eMKT research (2005), 20.1%; in research of Future Strategy Laboratory (2006), mostly. Thus, in this paper, we figure out whether advertisement placement actually affects users' perception on the information, which

subsequently affects users' attitude on Q&A services. Following Ruyter, Bloemer, and Peeters (1997), we merged information quality, which Q&A services provide, with service satisfaction and reuse intention in one conceptual model. On the top of the model, we set up simulated situations of Q&A with and without advertisement placement within the answers and compared how differently users perceive and think of the different situations. The finding of this study may extend the concept of advertisement placement by suggesting their use and effect in the text information, especially answers in Q&A services. Moreover, in the field of e-business especially that focuses on the use and distribution of information, web service developers and service control managers may gain the idea to set up some regulating rules for users to improve service qualities by controlling advertisement placement inside information.

LITERATURE REVIEW

Question and Answer (Q&A) Services

Online Q&A services have evolved from existing Q&A boards. In Q&A services, random users' questions and answers are saved and managed as a form of database under the systematic categories (Lee and Kang, 2003). Online Q&A sites are purposefully designed for people to ask and answer questions on a broad range of topics (Harper et al., 2008). An underlying assumption of the Q&A approach to Web searching is that users find answers to their queries expressed in natural language question queries (Spink and Ozmultu, 2002).

According to the literature review, there are three types of Q&A services: "digital reference services", "ask an expert services", and "Q&A community services" (Harper et al., 2008). *Digital reference services* represent the online library reference services (Pomerantz et al., 2004). The examples of the digital reference services are "Ask Librarians Online" (http://www.nypl.org/questions/). This reference service mostly relies on specific people performing specific tasks so that this type of reference services maintains the organized and structured model of question answering (Mcclennen & Memmott, 2001). *Ask an expert services* are staffed by experts in a relatively circumscribed topic area, such as science (e.g. MadSci Network, http://www.madsci.org), oceanography (e.g. Ask Jake, http:// www.whaletimes.org), or programming (e.g. Stackoverflow, http://stackoverflow.com). As these services tend to be topic-oriented, members are usually restricted to people in the field of study. *Q&A community services* are Q&A services open to every field of studies including general everyday questions to professional questions. Established examples are Knowledge In and Yahoo Answers. This type of services can also include services mentioned above, *Digital reference services* and *Ask an expert services*, by opening the services to anyone including librarians and experts in every field. In this study, we are going to focus on the Q&A community services, which can cover the large range of services.

These Online Q&A services create value by transferring individual tacit knowledge into the form of explicit knowledge which can be shared by others. Tacit knowledge is so personal that it is hard to formalize or share with others, while explicit knowledge is expressed in words and shared in the form of data (Polanyi and Sen, 1958). According to Nonaka's Spiral evolution of knowledge conversion and self-transcending process, tacit knowledge becomes explicit knowledge by involving in the socialization and externalization processes (Nonaka and Konno, 1994). When tacit knowledge is shared and exchanged through joint activities, it becomes more explicit. As online Q&A services serve users providing a place where the joint activities of knowledge exchanges are conducted, the services are changing tacit knowledge to explicit knowledge (Lee and Kang, 2003). Explicit knowledge is a foundation of organizational and social knowledge, for it is transmittable in formal and systematic language which can be captured in records. Thus, for the creation of new knowledge that can be shared and used, it is important to find the way to increase individual members' commitments to show their tacit knowledge so that it can become explicit knowledge (Nonaka, 1994).

Advertisement Placement

Deriving from the definition of the product placement, advertisement placement inside information can be defined as the inclusion and exposure of implicit or explicit advertisement of products or services inside the information (Product placement, Karrh, 1995). Unlike the researches investigating the positive impact of product placement on product and brand attitude (Karrh, 1995; Babin and Carder, 1996; Gregorio and Sung, 2010), and on brand recall (Zaragoza and Mitchell, 1996; Gupta and Lord 1998), market research has reported the negative reaction of users toward both inward and outward advertisement placement inside information, especially in Q&A community services (eMKT research, 2005; Chang, 2006). The examples of advertisement placement inside information in Q&A services are given in figure 1. The first example is from Yahoo Answers and the second one is from Naver Knowledge In. Advertising comments indicating specific organization name, e-mail address, or website URL are covered with mosaic.

The advertisement placement inside information is rife in Q&A community services, because the information in the services is searched and read by a large number of users especially who are interested in the related topics. However, the impact of this advertisement placement inside information both on Q&A service providers and on advertising organizations has not yet been revealed.

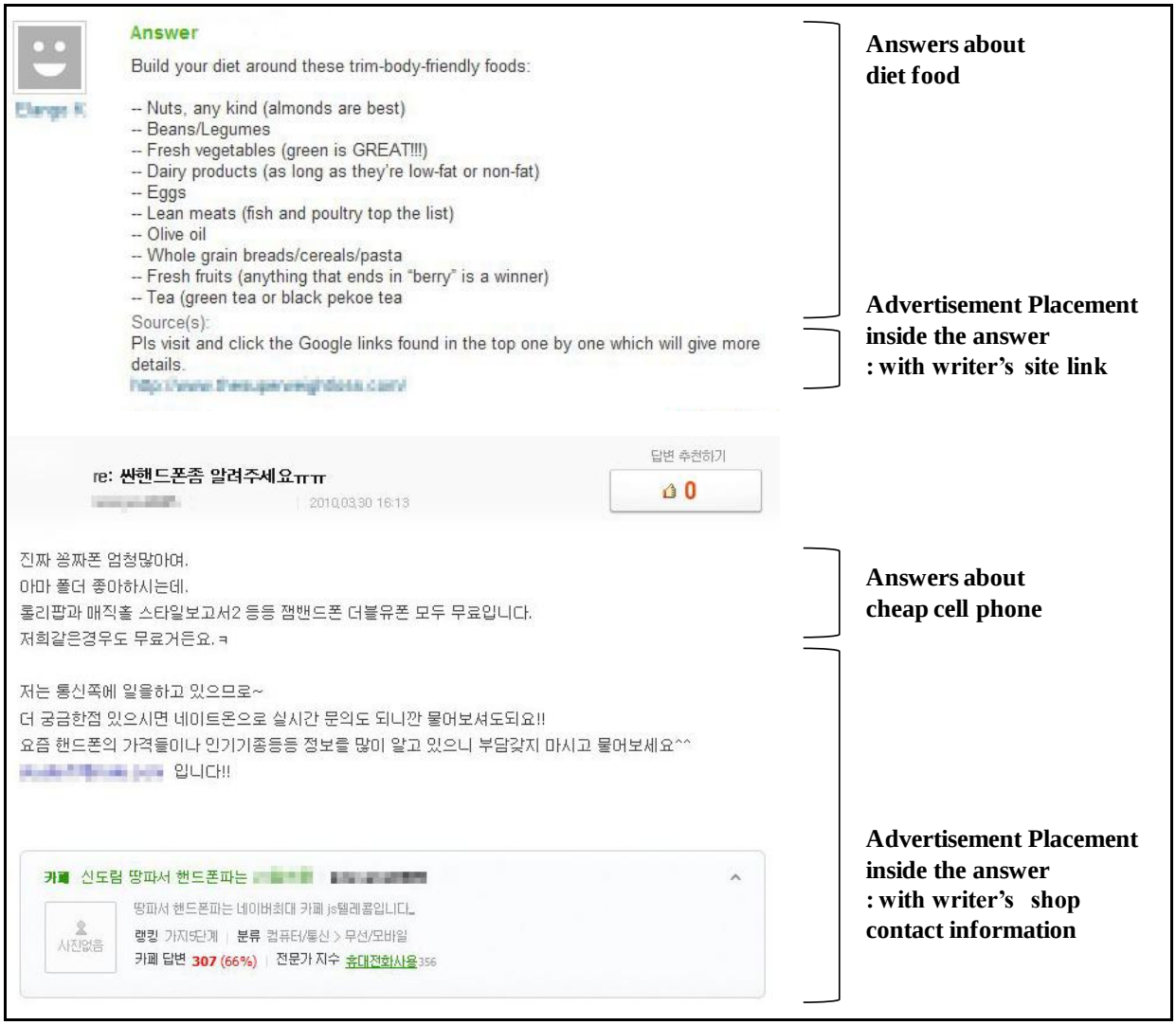


Figure 1. Examples of Advertisement Placement

Perceived Information Quality

In Q&A community services, the main product that the services provide is the answered information, so the information quality of answers is a key for the services to succeed. It is important to not only keep the absolute information quality but also provide the information of high perceived quality. Perceived information quality in this sense is a complex and multifaceted concept encompassing various dimensions such as reliability, completeness, and more (Wang and Wang, 2008). It is based on the assumption that users' judgments to choose particular information over others are giving value (Rieh, 2002). What dimensions are included in the construct of perceived information quality have not yet formed a consensus. Since the concept of perceived information quality is so complex and multifaceted, in this study we compose the concept as a second-order factor with multiple first-order factors. The dimension of perceived information quality studied so far is listed in Table 1. Among the information quality dimensions, we selected accuracy, completeness, usefulness, and clarity as first-order factors of the information quality. The decision is based on covering the big view of information quality categories; intrinsic, contextual, representational, and accessibility. The specific reasons for decisions are mentioned in each comment row.

View	Dimension	Definition	Previous studies	Comments
Intrinsic Information Quality	Accuracy	The factual factors with consistency and believability so that users are able to rely on the information	Bailey & Pearson, 1983; Ives et al., 1983; Baroudi and Orlikowski, 1988; Doll and Torkzadeh, 1988; Wixom and Todd, 2005	Select as a first-order factor
	Reliability	The believability of the information (believable, consistent, accuracy)	Bailey and Pearson, 1983; Ives et al., 1983; Baroudi and Orlikowski, 1988; Doll and Torkzadeh, 1988	Accuracy can include this concept (Rieh, 2002)
	Precision	The factual exactness (accurate, reliable)	Bailey and Pearson, 1983; Ives et al., 1983; Baroudi and Orlikowski, 1988; Doll and Torkzadeh, 1988	Accuracy can include this concept (Rieh, 2002)
Contextual Information Quality	Relevance	Whether they fit on the purpose so that relevant (relevant, related, applicable, useful)	Bailey and Pearson, 1983; Davis et al., 1989; Doll and Torkzadeh, 1988; Wilkerson et al., 1997; Bruce, 1998	Usefulness can include this concept
	Completeness	Whether the concept can cover the extent of information completely (complete, detailed, sufficient)	Bailey and Pearson, 1983; Ives et al., 1983; Baroudi and Orlikowski, 1988; Doll and Torkzadeh, 1988; Wixom and Todd, 2005	Select as a first-order factor
	Usefulness	The users' assessment of the likelihood that the information will enhance their decision (use, purpose, relevant)	Bailey and Pearson, 1983; Davis et al., 1989; Venkatesh and Davis, 1996; Abels et al., 1997; Venkatesh and Davis, 2000	Select as a first-order factor
	Currency	The timeliness of the information (continuously updated , current)	Bailey and Pearson, 1983; Ives et al., 1983; Doll and Torkzadeh, 1988; Wilkerson et al., 1997; Wixom and Todd, 2005	Q&A service is based on the currency
Representational Information Quality	Format	The visual settings or typographical features and how information is represented	Bailey and Pearson, 1983; Doll and Torkzadeh, 1988; Katerattanakul and Siau, 1999; Wixom and Todd, 2005	Too broad concept to be measured as perception
	Conciseness	The conciseness enough to be clear so that understand and interpret well	Hlynka and Welsh, 1996; Kim and Oh, 2009	Clarity can include this concept
	Clarity	The clarity to the point (concise, clear, understandability)	McKinney et al., 2002; Kim and Oh, 2009; Kim, 2010	Select as a first-order factor
Accessibility Information Quality	Accessibility	The availability of the access to the site, the safeness of data	Goodhue, 1995; Wang and Strong, 1996	Site-related feature

Table 1. Perceived Information Quality Dimensions (McKinney, Yoon and Zahedi, 2002; Lee et al., 2002, Wixom and Todd, 2005; Kim and Oh, 2009)

THEORETICAL FOUNDATION

The framework of the current study is built on the concept of perceived information quality and theory of reasoned action (TRA) based on the user's attitude.

As perceived information quality is a multifaceted concept and comprised of many aspects of information, the dimensions are not directly measurable. Therefore, the salient dimensions of perceived information quality are firstly identified and measured as latent variables. Then, the dimensions are used to construct a second-order factor that represents perceived

information quality (McKinney, Yoon, and Zahedi, 2002). Basically, users may feel satisfaction or get any attitude according to the information quality measured with the salient first-order factors.

According to the theory of reasoned action which has become a widely accepted model for individual's behavior, a person's attitude and subjective norm determine the intention which predicts a person's behavior (Ajzen and Fishben, 1977). In studies of recent years, TRA has been used to explain a person's behavior related to IT, such as web-consumer behavior (Lu & Lin, 2002). As individuals perceive information in the Q&A services based on their needs to gratify their curiosity, subjective norm concerning what the society thinks is not appropriate to apply. Thus, in this study we focused on the perception-attitude-intention path.

Based on our theoretical proposition that information quality affects the user satisfaction and attitude, and these attitudes determine user's behavior intentions, our framework was developed. Drawing from this framework, we demonstrated how information with advertisement placement affects perceived information quality and in result how the perception impacts on service providers.

RESEARCH MODEL AND HYPOTHESES

Research model is developed based on our conceptual propositions that information quality is the basic factors affecting satisfaction, and the satisfaction affects behavior intention such as reusing the service or visiting the website. The logic of the hypotheses is explained below with discussion of related constructs.

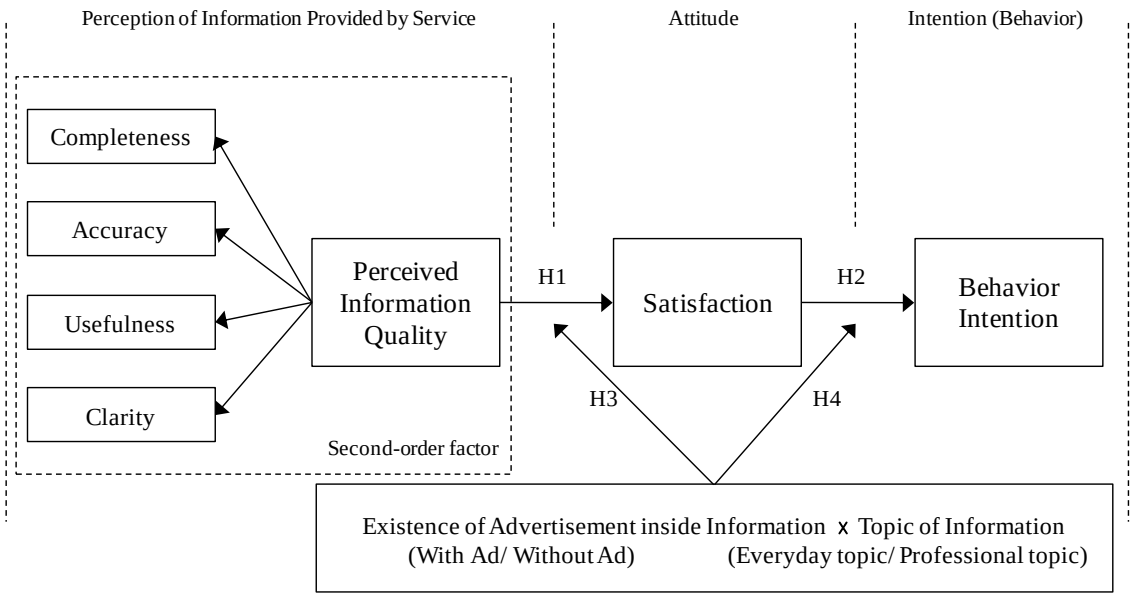


Figure 2. Research Model

Perceived Information Quality and Satisfaction

User information Satisfaction has been studied with user perceived information quality and user perceived information system quality (Komiak and Ilyas, 2010). Pearson (1977) developed a list for factors that contribute user satisfaction related to user perceived information quality. The items for the satisfaction were based on the output information quality (e.g. information is superior-inferior, sufficient-insufficient, important-unimportant). Gallagher's criteria (1974) focus on perception on user's perceived information value and are named as system acceptance and output quality. Though the previous studies over relation between user perceived information quality and satisfaction have developed supplementing existing problems, the basic assumption that information quality and system quality impact user satisfaction on information system has been revealed to be robust (Ives, Olson, and Baroudi, 1983). In addition, according to the expectancy disconfirmation theory, when people are faced with the situation against their expectation, they will be more likely upset. On

the other hand, when the expectancy is fulfilled, users will be satisfied (Westbrook and Reilly, 1983). Accordingly, as open Q&A service communities users expect get qualified answer information on their question, when the expectancy is fulfilled, the users will besatisfied. Therefore in this study, we argued that users' perceived information quality is a key factor that affects overall satisfaction in open knowledge sharing services.

Hypothesis 1: Perceived quality of information on the Q&A service positively influences satisfaction on the service.

Satisfaction and Behavior Intention

User satisfaction is the central concept of the marketing area and is thought to be the ultimate goal of the market economy (Pfaff, 1976; Erevelles, Srinivasan, and Rangel, 2003). Moreover, user satisfaction has been studied as an important area of IS research, for it is considered as a perceptual or subjective measure of the system success (Ives, Olson, and Baroudi, 1983). As the online market has enlarged, Internet Service Providers (ISPs) are thinking of the concept of user satisfaction as well.

Satisfaction is defined as a post-choice evaluation concerning a specific purchase of products or use of services (Oliver, 1979). After users experience and perceive some products or services, they do not simply forget the experience but develop certain attitudes about the products or services. One of the attitudes that users might take can be shown in a degree of satisfaction. When a high degree of satisfaction occurs, people will remember the experience and reuse the item, and they might urge others to try the products or services. Even sometimes they take some "public actions" such as writing agencies to report the favorable experience (Gerstner and Day, 1977). As the Internet makes it easier to reach others and communicate with them, the results when a high or low degree of satisfaction occurs become more critical. Users can easily share their satisfaction or dissatisfaction on the item with a large number of crowds, recommend or disapprove of the item to the crowds. Their public actions have become much more linked to others and influential (December, 1996).

In this research, we defined user satisfaction as overall emotional reaction and attitude toward the entire service that users experienced. As this definition focuses on the process of choice and post-choice evaluation, user satisfaction is connected to the post-choice behavior. According to TRA, when people have an attitude about the item, they will have an intention to reflect their attitude to any behaviors. These behaviors are captured as repurchase of the item, reuse of the service, or recommendation to others (Zeithaml, Berry, and Parasuraman, 1996; Cronin, Brady, and Hult, 2000). We defined behavior intention as repurchase or reuse of the service in this study. In addition, as a person's behavioral intention is believed to be the immediate determinant of that person's actual behavior, we considered the behavioral intention similar to behavior (Ajzen and Fishbein, 1980). According to the definitions and logic, Hypothesis 2 is proposed as follows:

Hypothesis 2: User satisfaction on the Q&A service positively influences behavior intention in the service.

Existence of Advertisement inside Information and the Area of Topic

How current Q&A service users perceive advertisements inside information is explained in the above section. As advertisement inside information distracts users who intend to find information needed, and the advertisement is against the intention of users, it may lower the effect of information quality to satisfaction and behavior intention.

The classification of topics is especially studied in the medical area, where the terms are too complicated to be understood by general people. Thus, there have been efforts to make the professional area be understood by non-professionals by using everyday discourse (Gieryn, 1983). In this study, adopting from the dimension classified by Hirschkorn (2006), we categorize topics of Q&A into professional and everyday. Those two classifications are distinguished by their level of exclusivity. Everyday knowledge is accessible to an undefined number of people and even further to everybody. This knowledge does not need a long time to learn or acquire, and even can be gained in everyday life. For example, anyone "can" know how to fold their blanket and do the dishes, and even how to do those tasks in a better way. Professional knowledge is regarded as restricted to exclusive experts. This knowledge needs long time to learn or acquire. For example, only exclusive experts know how to perform a heart transplant operation. As we pay more on rare items, we appreciate more on exclusive professional information. Accordingly, the exclusive information makes people more satisfied at a certain quality of information. Hence, we propose two hypotheses for testing:

Hypothesis 3: The Existence of Advertisement inside Information and the topic of information will moderate the relationship between perceived information quality and satisfaction.

Hypothesis 4: The Existence of Advertisement inside Information and the topic of information will moderate the relationship between satisfaction and behavior intention.

RESEARCH METHODOLOGY

To test our model and hypotheses, we used an online survey method. The primary sample was the Internet users. Survey data were analyzed by SPSS 18.0 and Smart PLS 2.0 with a quasi-experiment-based structural equation modeling method.

2x2 Scenarios Design and Research Procedure

There were four scenarios in this quasi-experiment. The scenarios were made by two criteria; based on the field that questions were put on, the scenarios were divided into a professional case and an everyday case; and based on the existence of advertisement placement inside the information, the scenarios were also divided (2x2 scenarios design). Accordingly, we had four scenarios to be shown for inquiring into the online users' perception and responses. Following the study on the topics of Q&A services, we developed the scenario to conduct the experiment. Adamic et al. (2008) tracked answer patterns across topics in *Yahoo! Answers*, drawing on 433,402 answers. Also, they tracked the topic categories of *Naver Knowledge In*. According to their tracking information, popular cases for questions were selected; medicine for professional and housework for everyday case. For each case, answers with and without advertisement placement were developed. Survey respondents were asked to respond to the questionnaire about how they perceive the information of the answer in the service and the service providers. The cases were distributed randomly; when respondents accessed to the survey website, the site randomly assigned the cases.

Sample

A sample was drawn from random internet users. Total 213 responses were collected over a month (December, 2010). Among total responses, 19 insincere responses were discarded through filtering, and 194 completed responses were used for data analysis, including 125 males (64.4%) and 69 females (35.6%). All of them were Korean, and the survey was conducted in the Korean language (Hangul). 91.3 percent of them were under 30 years of age and 95.9 percent responded that they were using the Internet daily. The majority of the respondents (96.4%) had previous experiences of using online open Q&A services.

Measurement development and pretest

A survey questionnaire was developed by reviewing the appropriate measurements from the literature discussed above. Some measurements were modified to be more appropriate for the context of contribution in online open Q&A services. Each item was measured on a seven-point Likert scale, ranging from "disagree strongly" to "agree strongly".

Before conducting the main survey, we performed a pretest to validate the instrument and reduce possible ambiguity. Over a month (October, 2010), 76 responses were collected for pilot test. Responses from this pilot test led to further item eliminations and modifications. The final questionnaire items are provided in Table 2.

RESULTS

To test the proposed research model and hypotheses, data analyses for both the measurement model and structural model were performed using Partial Least Square (PLS). We used Smart PLS 2.0, an opensource software application for graphical path modeling with latent variable, because of its adequacy of applying the second order factor analysis and its advantages of minimal demands on sample size and residual distributions (Chin, 1998).

Descriptive Statistics and Preliminary Test

Before conducting the main analysis, we compared the responses on each scenario using descriptive statistics and one-way ANOVA. In an ANOVA test, each scenario was the independent variable, and total information quality, satisfaction, and behavior intention were the dependent variable. Each scenario was numbered for simplicity: answer on everyday topic without advertisement as Group (1), G1; answer on professional topic without advertisement as Group (2), G2; answer on everyday topic with advertisement as Group (3), G3; answer on professional topic with advertisement as Group (4), G4. Descriptive statistics and one-way ANOVA were calculated and shown in Table 3.

Item			Measure	Revised from
Perceived Information Quality (PIQ)	Completeness (C)	c1	This answer includes all necessary values	Ives et al., 1983 Wixom & Todd, 2005
		c2	This answer covers the needs of my questions	
		c3	This answer is insufficient and incomplete for my needs (R)	
	Accuracy (A)	a1	This answer is accurate	Bailey & Pearson, 1983 Wixom & Todd, 2005
		a2	This answer is based on facts	
		a3	This answer presents an impartial and accurate view for answers	
	Usefulness (U)	u1	This answer is useless (R)	Davis et al., 1989 Abels et al., 1997
		u2	This answer is relevant to my needs so that I can use it	
		u3	This answer is useful to my needs	
	Clarity (Cl)	cl1	This answer is formatted and presented concisely	Kim & Oh, 2009 Kim, 2010
		cl2	This answer is clear to the point	
		cl3	This answer is clear to comprehend	
Satisfaction (SA)		s1	After using this Q&A service, I am very satisfied	Wixom & Todd, 2005 Yang et al., 2005
		s2	I am pleased to get this answer for my question.	
		s3	Overall, getting this answer gratifies my needs for use Q&A services.	
		s4	It is unpleasant to get this answer (R)	
Behavior Intention (BI)		bi1	I will revisit this service website again.	Lee et al., 2002 Kim & Oh, 2009
		bi2	I will ask questions in this service again.	
		bi3	I will reuse this Q&A service again.	

Table 2. Measurement Instrument

Scenario	Answer without Advertisement				Answer with Advertisement				Total (n=194)		ANOVA (df=3)			Post Hoc (Scheffe)
	(1) Everyday topic (n=48)		(2) Professional topic (n=49)		(3) Everyday topic (n=49)		(4) Professional topic (n=48)							
	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D	MS	F	p	Different Groups
Completeness	4.41	1.20	4.87	0.98	3.94	1.26	4.53	1.26	4.44	1.22	7.28	5.244	0.02	(2)-(3)
Accuracy	4.44	1.24	5.01	1.13	3.78	1.12	4.77	1.03	4.50	1.13	13.75	10.73	0.00	(1)-(3), (2)-(3), (3)-(4)
Usefulness	4.85	1.29	5.27	0.92	4.29	1.23	4.80	1.18	4.80	1.21	7.79	5.763	0.00	(2)-(3)
Clarity	4.07	1.56	4.57	1.14	3.72	1.17	4.10	1.15	4.12	1.29	6.07	3.78	0.01	(2)-(3)
Information Quality	4.47	1.15	4.95	0.82	3.93	1.01	4.55	0.96	4.47	1.05	8.42	8.62	0.00	(2)-(3), (3)-(4)
Satisfaction	4.65	1.26	5.15	0.80	3.05	0.88	4.58	1.08	4.35	1.29	40.38	38.80	0.00	(1)-(3), (2)-(3), (3)-(4)
Behavior Intention	4.59	1.33	5.14	0.94	3.06	0.94	4.51	1.21	4.32	1.35	38.92	31.26	0.00	(1)-(3), (2)-(3), (3)-(4)

Table 3. Descriptive Statistics and ANOVA

Apparently, a group experiencing answers on everyday topic with advertisement (Group (3)) has a significant difference with every other group (significant at the 0.05 level and marked in Table 3 as different groups). Descriptive statistics and ANOVA test show that when answers on everyday topic are written with advertisement inside the information, users' perceived information quality, satisfaction, and thus behavior intention become noticeably decreased.

Measurement Model

Before analyzing the structural model, reliability and validity were checked for the measurement model assessment. Internal consistency was checked using Cronbach's alpha and composite reliability and shown in Table 4 (Fornell and Larcker, 1981). All of the Cronbach's alpha and composite reliability are above general requirements, 0.70. In addition, each Average Variance Extracted (AVE) is above 0.50, satisfying an acceptable threshold for research (Nunnally and Bernstein, 1978).

		Answer without Advertisement						Answer with Advertisement						Total		
		(1) Everyday topic (n=48)			(2) Professional topic (n=49)			(3) Everyday topic (n=49)			(4) Professional topic (n=48)					
Variable	Item	AVE	C.R.	C.α	AVE	C.R.	C.α	AVE	C.R.	C.α	AVE	C.R.	C.α	AVE	C.R.	C.α
Perceived Information Quality (PIQ)	c1	0.65	0.85	0.73	0.58	0.80	0.71	0.66	0.85	0.71	0.69	0.87	0.78	0.66	0.85	0.74
	c2															
	c3															
	a1	0.78	0.92	0.86	0.79	0.92	0.87	0.74	0.89	0.82	0.76	0.90	0.84	0.78	0.91	0.86
	a2															
	a3															
	u1	0.72	0.88	0.79	0.72	0.89	0.81	0.76	0.90	0.84	0.77	0.91	0.85	0.91	0.91	0.85
	u2															
	u3															
	cl1	0.87	0.95	0.93	0.70	0.87	0.79	0.63	0.83	0.74	0.75	0.90	0.83	0.74	0.90	0.83
	cl2															
	cl3															
Satisfaction (SA)	s1	0.73	0.91	0.86	0.63	0.87	0.80	0.78	0.91	0.86	0.69	0/90	0.85	0.78	0.93	0.90
	s2															
	s3															
	s4															
Behavior Intention (BI)	bi1	0.90	0.97	0.95	0.77	0.91	0.85	0.74	0.90	0.83	0.81	0.93	0.88	0.86	0.95	0.92
	bi2															
	bi3															

Table 4. Reliability and Validity

After ensuring internal consistency, the discriminant validity test was conducted by checking inter-correlation among the constructs, using a cross-loading matrix and a correlation matrix with the square root of AVE. As shown in Table 5, every square root of AVE was greater than every other inter-correlation estimate, and accordingly it provides evidence for discriminant validity in this case.

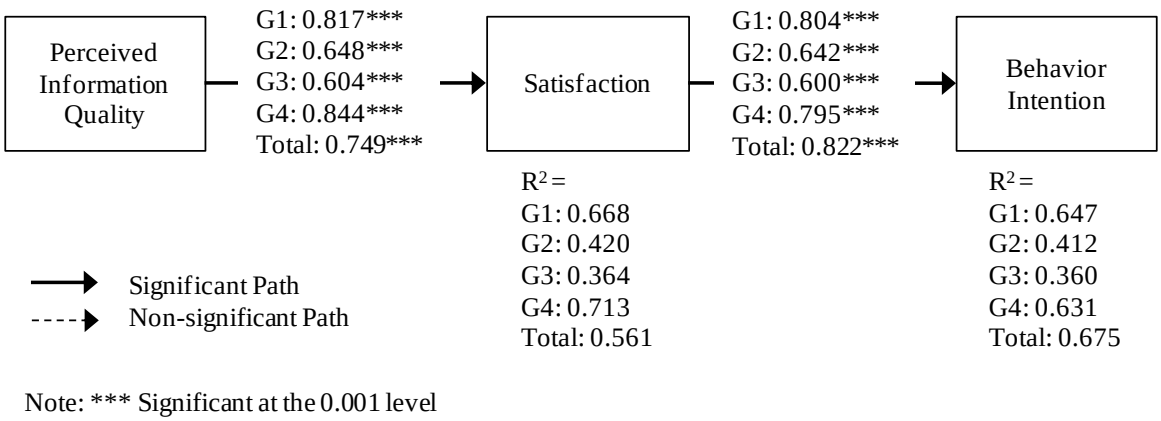
	Completeness	Accuracy	Usefulness	Clarity	Satisfaction	Behavior Intention
Completeness	(0.81)					
Accuracy	0.65	(0.88)				
Usefulness	0.69	0.67	(0.88)			
Clarity	0.55	0.59	0.61	(0.86)		
Satisfaction	0.66	0.65	0.66	0.57	(0.88)	
Behavior Intention	0.53	0.60	0.59	0.48	0.81	(0.93)

* Diagonals in parentheses represent the square root of AVE

Table 5. Discriminant Validity (Total)

Structural Model

Figure 3 presents the result obtained from PLS analysis. The significant structural relationship is shown both in each group and in total group. Hypothesis 1 and 2 are strongly supported at p<0.001. Moreover, we can see G1 and G4 have the similar aspects in β and R^2 value, and so do G2 and G3. Table 8 also shows the result of path analysis by scenarios that respondents experienced for the survey. Every β for paths is supported at p<0.001.



Note: *** Significant at the 0.001 level

Figure 3. Results of Structural Model

		Scenario (1), n=48			Scenario (2), n=49			Scenario (3), n=49			Scenario (4), n=48		
	Path	P.C.	S.E.	t-value	P.C.	S.E.	t-value	P.C.	S.E.	t-value	P.C.	S.E.	t-value
H3	IQ -> PS	0.817	0.059	13.941	0.648	0.073	8.914	0.604	0.081	7.418	0.844	0.039	21.863
H4	PS -> BI	0.804	0.054	14.793	0.642	0.095	6.787	0.600	0.099	6.045	0.795	0.054	14.606
		Scenario (1+2) : Without Ad			Scenario (3+4): With Ad			Scenario (1+3): Everyday Topic			Scenario (4): Professional Topic		
	Path	P.C.	S.E.	t-value	P.C.	S.E.	t-value	P.C.	S.E.	t-value	P.C.	S.E.	t-value
H3	IQ -> PS	0.772	0.048	16.174	0.728	0.054	13.457	0.703	0.059	11.876	0.778	0.038	20.212
H4	PS -> BI	0.761	0.048	15.797	0.806	0.049	19.679	0.816	0.040	20.244	0.751	0.053	14.249

Table 6. Path Analysis according to Scenarios

In addition, the Chin test was used to test the moderating effect of each situation, with/without advertisement and everyday/professional topic. The significance test equation for the Chin test is as follows:

$$t = \frac{path_{sample_1} - path_{sample_2}}{\sqrt{\frac{(m-1)^2}{(m+n-2)} \times S.E^2_{sample1} + \frac{(n-1)^2}{(m+n-2)} \times S.E^2_{sample2}} \times \sqrt{\frac{1}{m} + \frac{1}{n}}}$$

Table 7 provides the result of Chin test conducted based on the information in Table 6. In the Chin test, we tried to examine every possible combination that can be compared. According to the multi group analysis using the Chin test, there was no significant effect of the existence of advertisement and the field of the topic respectively. However, the result implies that the two factors work together affecting user perception of information quality, satisfaction, and behavior intention. Especially, in the open knowledge Q&A service, users' perceptions on the everyday topic questions that anyone who know the answers can respond to and the professional topic questions that only people who have the professional knowledge can respond to were opposite. For everyday topics, when there are advertisements inside the information, users satisfy less on certain information

quality. On the other hands, for professional topics, when there are advertisements inside the information, users satisfy more on certain information quality.

		Group (Scenario) Difference (T-statistics)							
		(1) & (2)	(1) & (3)	(1) & (4)	(2) & (3)	(2) & (4)	(3) & (4)	(1+2) & (3+4)	(1+3) & (2+4)
H3	IQ -> PS	3.574 ***	4.375 ***	-0.625	0.768	-3.696 ***	-4.066 ***	1.198	-1.727
H4	PS -> BI	3.330 ***	4.104 ***	0.223	0.564	-2.205 *	-2.680 **	-1.220	2.047 *

Table 7. Multi Group Analysis

DISCUSSION

The aim of this study was to explore open knowledge sharing services, especially Q&A services, and investigate the importance of managing perceived information quality. Our interest was mainly on the advertisement inside information, as it is reported that such tricky advertisement is sometimes confused as real information and distracting users focus on information they really needed.

The empirical results of this study suggest that perceived information quality is an important element of such knowledge services to be successful. One interesting finding is that whether there is advertisement inside information or not has opposite influence on information of everyday topics and professional topics. For the everyday topic information, users tend to react to advertisement negatively. On the other hands, for the professional topic information, when answerers put their name and organization advertising comments along with the answer, users are likely to prefer it. As advertisement inside information is considered to distract users and diminish an amount of content that users can concentrate on, it is normal that users satisfy less on information with advertisement inside (Jain and White, 2009). However, it is interesting that for professional knowledge, advertisement can affect in opposite direction. One possible reason is that when knowledge is exclusive and professional, users are taken the advertisement inside information as authorship information which increases accountability.

This study has both academic and practical contributions. From an academic perspective, the importance and role of perceived information quality in the context of open knowledge sharing services are investigated. Moreover, the meaning of advertisement inside information is extended by examining information of different categorical topics. Once advertisement inside information is considered as tricky junk information which distracts users to use online services and acquire relevant knowledge, but through this study in professional and exclusive field, the advertisement could positively act by providing authorship. From a practical standpoint, the results highlight factors that service managers need to keep in mind. As crowdsourcing and open knowledge sharing have advantages that anyone who has the knowledge can access to others who need the knowledge, users expect to gain knowledge that some exclusive crowds may know. Accordingly, while information of everyday topics which seem to be known to many people is little appreciated, information of professional topics which seem to be known only to exclusive experts is appreciated a lot. Therefore, distracting advertisement in information of everyday topics requires careful handling to maintain user satisfaction. Moreover, it could be recommended to provide user information on professional topical information. The information could not only advertise the experts in the specific field but also increase user satisfaction by informing users that the professional information is actually coming from real experts.

While we believe we have developed a model with sufficient theoretical background and tested it with reliable and valid method, there are some limitations. First, we surveyed around 200 respondents, and it might be insufficient to test the model fit. Second, as the absolute information quality is controlled in quasi-experiment, we did not have chance to investigate various elements that can affect perceived information quality. Factors such as manner of discourse and individual preference on open knowledge sharing services can also affect users' perception. This article, addressing the meaning of advertisement inside information and information topic on perceived information, is hopefully a useful step in improving open knowledge sharing on the Internet.

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