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Effects of the Web 2.0 and Social Network Services Environment on Information Quality and Intentions to Re-Use

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EFFECTS OF THE WEB 2.0 AND SOCIAL NETWORK SERVICES ENVIRONMENT ON INFORMATION QUALITY AND INTENTIONS TO RE-USE[1]

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Abstract

Recent penetration of Web 2.0 and social network services (SNS) seems to make information quality (IQ) in those services more important. The main objective of this research is to grasp the impact from system quality to dimensions of information quality and to analyze relationships among those qualities and intention to re-use in Web 2.0 services including SNS. Based on socio-technical approach, information quality research, the updated IS success model and the IS diffusion variance model, the structural equation model is constructed and empirically tested. The result shows that system quality positively affects both intrinsic IQ and contextual and representational IQ, and that the latter exerts more impact on intention to re-use than the former. System quality also positively affects intention to re-use. Researches for the impact from system quality to information quality are scarce, thus our research contributes to this topic. We also found that the role of technical compatibility and user interaction environment on system quality is important and there is little lock-in effect for Web 2.0 services. The result of this research suggests a strategy for practitioners of these services to keep their competitive edge and retain users.

Keywords: Web 2.0, social network services, socio-technical approach, system quality, information quality, intention to re-use.

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1 INTRODUCTION

Web 2.0 is defined as a second generation, or more personalized, communicative form of the World Wide Web that emphasizes active participation, connectivity, collaboration and sharing of knowledge and ideas among users (McLoughlin & Lee 2007). In Web 2.0 and mobile communication environment, various services such as social network services (SNS), Really Simple Syndication (RSS), tagging, and mobile applications for smartphones enable us to access more information sources (Fröhlich et al. 2011) and to interact with other users more easily than ever before (Adams 2010; Hughes 2010; Yoo 2010). Facing much more information and user interaction than before, users have a better opportunity to decide on which information they rely on.

Information quality is also expected to be enhanced under these Web 2.0 services environments (Sharp 2006; Boulos & Wheeler 2007; Surowiecki & Silverman 2007). Researchers studying collective intelligence, the wisdom of crowds, knowledge sharing and e-learning in light of Web 2.0 services have stated that the Web 2.0 environment fundamentally facilitates people's activities with information (including knowledge) such as generating and sharing it (Wang 2009; Hughes 2010; McIver 2007; Arazy et al. 2011). Levy (2009) and Razmerita et al. (2009) argue that social media are close to some ideal media of sharing knowledge, information, and data (Krogh 2012). SNS users create content in the SNS. This content can be utilized as social resources of the internet, especially as knowledge and information (Bradbury 2003).

The social-technical approach sees that a mutually shaping relationship exists between information and collaboration practices and the tools developed for communication and knowledge sharing (Talja & Hansen 2006). And the socio-technical systems (STS) theory consists of (a) a technical subsystem, (b) a personal subsystem, (c) an external environment, and (d) a work system design, all of which are mutually interdependent (Hendrick & Kleiner 2001). Kim (2008) applied STS theory to blogs. According to this theory, personnel subsystems (bloggers) and technical subsystems mutually influence each other to enhance interactivity in the blogsphere. We believe that the socio-technical approach can be also applied to Web 2.0 services and SNS environment. With the point of this approach, system quality and user's interaction can make information quality enhanced.

We, thus, concentrated on the issue of information quality improvement in Web 2.0 services and SNS environment. We believe that due to the introduction of these services, information quality circulated through those services can be more easily reinforced.

On information quality and its underlying dimensions, there is a large body of research. (Wang & Strong 1996; Lee et al. 2002; Hilligoss & Rieh 2008; Arazy & Kopak 2011). Researchers have focused on identifying important dimensions of information quality but have only reached agreement on the point that information quality is a multi-dimensional concept, for which an extensive number of studies have introduced a number of indicator variables (Lee et al. 2009).

There has also been abundant research on Web 2.0 services considering system quality, information quality or both. Topics such as the impact of system quality or information quality on the behavioral intentions of users in Web 2.0 services have been considered (Lee et al. 2009; Udo et al. 2010). The information quality of Web 2.0 services weighted by users has also been examined (Lin 2008; Kim et al. 2009; Lee et al. 2009).

To the best of our knowledge, however, information quality and Web 2.0 related literature has paid little interest to the impact of the system quality of Web 2.0 services on the information quality circulated within these services. We think that only after considering the effect of system quality to information quality we can understand the behavioral intentions of Web 2.0 services and SNS environment better. It is, therefore, necessary to study the above impact from a theoretical and practical point of view.

In this way, we want to reveal the impact from the Web 2.0 system including SNS on information quality. Previous researchers have not provided deep coverage on this impact. Furthermore we will examine the relationship among system quality, information quality, and intention to re-use Web 2.0 services. The research questions of interest are as follows.

Research question 1. How does system quality in Web 2.0 services influence information quality, especially regarding several dimensions of information quality?

Research question 2. How does system quality and information quality in Web 2.0 services influence re-use behavior of users for these services?

From these questions, we aim to provide a theoretical model to assess the relational impact among the system quality, information quality and intention to re-use in Web 2.0 services. The result will shed light to practitioners about what factors of system quality and what dimensions of information quality should be reinforced in order to provide better services and therefore increase re-use of their services.
This paper is organized as follows. In Section 2, we review previous literature on Web 2.0, information quality and the theories we considered. In Section 3, we construct the theoretical model and described the research methodology. In Section 4, empirical data analysis is performed and results are shown. In Section 5, we discuss the findings. Finally, in Section 6, conclusions are drawn, including relevant theoretical and practical implications.

2 LITERATURE REVIEW

2.1 The Characteristic of Web 2.0 services

The properties of Web 2.0 are described as collaboration, flexibility, participation architecture and interactivity (Boulos & Wheeler 2007). After considering other definitions (O'Reilly 2005; McLoughlin & Lee 2007) and the above characteristics of Web 2.0, we define Web 2.0 as 'the movement of opening information, through which services and platforms facilitate information sharing and voluntary participation within communities, which increases the value of information'.
One of common characteristics in Web 2.0 services is strong user interaction. Web 2.0 services such as SNS, tagging, blogs, RSS, etc., facilitate user interaction (McLoughlin & Lee 2007; Murugesan 2007; Cormode & Krishnamurthy 2008). This trend is reinforced by social media and smartphone applications. Furthermore, sensor-based smartphone applications like location-related apps can be designed to get better the more people use them, collecting data that creates a virtuous feedback loop that creates more usage (O'Reilly & Battelle, 2009). With this trend, users are encouraged to interact within a certain Web 2.0 services. This is because, to be successful in the market, Web 2.0 services require both active user interaction and well-designed systems accommodating them. For example, many web sites and blogs have an interconnective function like RSS, SNS, Twitter and so on. In order to support user interaction, Web 2.0 services should be interconnected seamlessly with other services so that users do not feel inconvenienced in utilizing other services' content. That means that Web 2.0 services should have compatibility with other Web 2.0 services. We will incorporate these characteristics of Web 2.0 services into our research model, which will be shown in Section 3.

2.2 Socio-technical approach

In everyday life, people routinely assist each other in solving information problems (McKenzie 2003). Talja and Hansen (2006) stated that receiving, interpreting, and indexing information-giving names to pieces of information for the purposes of retrieval and re-use are part of the routine accomplishment of work tasks and everyday life. They also mentioned that the social-technical approach sees that a mutually shaping relationship exists between information and collaboration practices and the tools developed for communication and knowledge sharing. Kling et al. (2003) introduced the concept of socio-technical interaction networks (STIN) to show the relationships between social actors, technologies and artifact. This model is useful for understanding the co-constitution of work practices and technologies-in-use.
In addition, the socio-technical systems (STS) theory consists of (a) a technical subsystem, (b) a personal subsystem, (c) an external environment, and (d) a work system design, all of which are mutually interdependent (Hendrick & Kleiner, 2001). The concept of STS theory recognizes organizations as open systems that are influenced by and influencing their external environments (Heller, 2001; Hendrick & Kleiner, 2001). Kim (2008) applied STS theory to blogs and saw that key features of blogs as interactivity, open system and non-technical internet users. According to this theory, personnel subsystems (bloggers) and technical subsystems mutually influence each other to enhance interactivity in the blogsphere. We believe that the socio-technical approach can be also

applied to Web 2.0 and SNS environment. With the point of this approach, the system quality and user's interaction can make information quality enhanced.

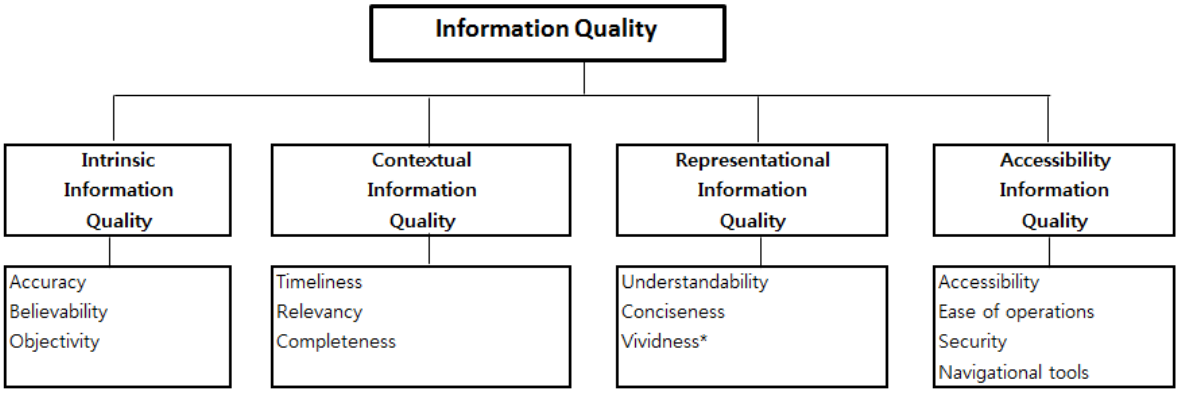
2.3 Information quality

There is a large body of research on the concept of information quality. However, scholars agree that information quality itself is a multi-dimensional concept and further studies have introduced a number of indicator variables (Lee et al. 2009). Eppler and Wittig (2000) reviewed twenty information quality frameworks that define and categorize quality criteria for information in various application contexts and evaluated seven frameworks. They argued that only Wang & Strong's framework offers both a solid foundation in existing literature and practical applications. Wang and Strong defined information quality into four dimensions: intrinsic, contextual, representational and accessibility.

Some dimensions of information lend themselves to measurement of quality that is intrinsic to the information itself, regardless of the context in which it is used (Watts et al. 2009). Intrinsic IQ is expected to be enhanced by increasing user interaction with Web 2.0 services. There are also dimensions of information quality that are dependent on the context in which they are used (Watts et al. 2009). This context-dependent nature of information quality has been widely acknowledged (Hong 2006). This contextual IQ, along with representational and accessibility IQ, are reinforced by Web 2.0 services including smartphone applications.

English (1999) categorized information quality into two dimensions, that is, inherent IQ and pragmatic IQ. The former matches intrinsic IQ in Wang and Strong and the latter to contextual IQ in Wang and Strong. Kö niger and Reithmayer (1998) categorized information quality into six dimensions. Among them, intrinsic IQ, access IQ and contextual IQ are similar in Wang and Strong's framework and the quality of presentation matches representational IQ in Wang and Strong's framework, too. Many other researchers, including Katerattanakul and Siau (2008, 1999), Herrera-Viedma et al. (2006), and Lee et al (2002), applied Wang and Strong's classification framework in web quality or web content studies. Lee et al. (2002) re-categorized the results of these researches on the information quality into Wang and Strong's framework.

We think it is reasonable to apply Wang and Strong's classification framework, including four primary IQ categories to Web 2.0 services since the four IQ categories combine appropriately and clearly articulate the information characteristics contained in Web 2.0 services. In this paper, therefore, we adopted the basic framework of Wang and Strong (1996) and adjusted information factors under information categories by consulting Herrera-Viedma et al. (2006)'s research results, which studied the information quality of web sites and can be easily applied to Web 2.0 services.



*Factors added to (Wang and Strong 1996) and (Herrera-Viedma, Pasi et al. 2006)'s classification

Figure 1. The framework for fixed/mobile Web 2.0 information quality

The reason we incorporated and rearranged information quality as Figure 1 is explained below. Among Wang and Strong's information framework, we eliminated factors such as appropriate amount, consistent representation, interpretability and value-added. There is an in-built tendency in Web 2.0

services to have the above four factors in common to facilitate users to obtain and understand information easily and gain increased value. Otherwise, services will go out of business due to lack of popularity. With this reason, these four factors are supposed not to make big difference in Web 2.0 services. That is why we ignored these factors in our analysis.

We also removed reputation from Wang and Strong and originality from Herrera-Viedma et al. (2006). Believability, we think, can include the concept of reputation in a broader sense, since in Web 2.0 services reputation is based on an actor's perceived history of behavior (Anthony et al. 2009) and thus can be obtained by a believable information source or actors from experience in the long run. For example, reputation systems are regarded as a key solution to the online trust problem and include the concept of believability (Utz et al. 2009). In addition, we considered factors like vividness from Katerattanakul and Siau (1999) and Lim and Lee (2007), since, with the progress of technology in Web 2.0 services, content formats such as pictures, videos and broadcasting of events on the spot are widely adopted by users. We placed vividness under representational information quality.

2.4 IS success model and IS diffusion variance model

In our research questions, we mentioned Web 2.0 system quality, information quality and the re-use of the Web 2.0 services. Theories that are relevant to our research should explain adoption or diffusion of newly introduced services since Web 2.0 services, including smartphone mobile applications, which were only recently introduced in the market. The Updated IS Success Model can be applied partly to our research questions since it has the quality variables consisting of system quality and information quality and this theory suggests the direct causal relationship from these quality variables on intention to use. In addition, the behavioral intention (BI) concept included in the Updated IS Success Model can explain adoption or diffusion of Web 2.0 services.

We also referred to the IS diffusion variance model (Bradford & Florin 2003; Cooper & Zmud 1990; Crum et al. 1996) since this theory mainly covers the causal relationship between the system characteristics and IS implementation success, which can be interpreted as adoption or infusion. The adoption of Information technologies by individuals and organizations is part of the process of IS implementation. In this paper, we mainly concentrated on individual adoption of Web 2.0 services, rather than infusion within organizations. In our model, therefore, we replaced the concept of IS implementation success with the concept of intention to re-use. This is because we believe that the adoption of Web 2.0 services can be interpreted as intention to re-use when regular or frequent usage by users is required for Web 2.0 services to succeed in the market. This theory consistently holds that technical compatibility (an innovation's compatibility with existing systems including hardware and software), technical complexity (the degree to which a certain innovation is difficult to understand and use), and relative advantage (the degree to which an innovation is perceived as being better than its precursor) are important antecedents to the adoption of innovations (Moore & Benbasat 1991; Bradford & Florin 2003). We considered that this theory fits well with the characteristics of Web 2.0 services in a sense that three antecedents are considered especially important by users in re-use of the Web 2.0 services in the environment whereby factors such as intuitive user interface/experience, accessibility without the limit of time and space, and relative advantage compared to other competing services play a major role in market penetration.

3 THEORETICAL MODEL AND RESEARCH METHODOLOGY

3.1 Research model

Using those theories and information quality categories summarized in the previous section, we constructed the research model in Figure 2. First, under the socio-technical approach, users as social actors and Web 2.0 including SNS as technical subsystems mutually influence each other. Technical subsystems in this environment are designed to attract users and gather data and triggers more usage again. Therefore, the system quality of Web 2.0 services including SNS causes vigorous interaction of users. That means that the system quality and interaction of users can lead to the enhancement of information quality those services contain. Many researches also expect the information quality to be enhanced under Web 2.0 service environments (Sharp 2006; Boulos & Wheeler 2007; Surowiecki &

Silverman 2007). Thus we believe that, in these environments, system quality can impact information quality, which is circulated through Web 2.0 services due to a hugely increased number of information and user interactions. Consequently, we decide to explore this issue. Therefore we contrived the causal relationship from system quality to information quality into our model.

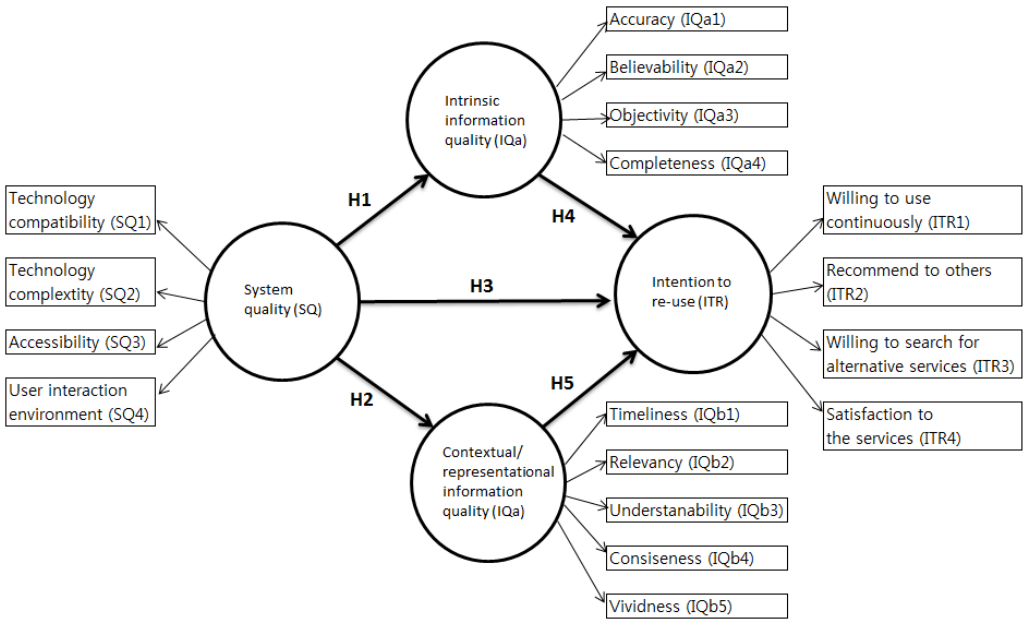


Figure 2. Research model

Second, we excluded service quality which is one of qualities in the IS success model from our analysis. A claim could be made that service quality is a subset of system quality (DeLone & McLean 2003). DeLone and McLean (2004) also only considered the factor of responsiveness alone under service quality in e-commerce. Web 2.0 services should provide quick customer response in order to survive intense competition. Moreover, the relationship from service quality to 'use' at an individual level of analysis is not empirically proved due to insufficient data in previous research (Petter et al. 2008). Hence it stands to reason that we excluded service quality from our analysis.

Third, we renamed "intention to use" from the updated IS success model to "intention to re-use" in our model. While the initial adoption of an information system plays a crucial role in its diffusion, it is the continued use of the system that determines its long-term viability and eventual success (Bhattacherjee 2001). For Web 2.0 services, we also deduced that initial usage for services does not guarantee continued usage.

Fourth, we divided information quality into two dimensions: intrinsic IQ, and contextual and representational IQ. In addition, we considered that accessibility IQ from Figure 1 are affiliated to the system quality in Web 2.0 services as explained in the following fifth reasoning. Intrinsic IQ is an important information category since it contains the fundamental meaning of the information as content regardless the context in which it is used. In addition, we believe that in many Web 2.0 services including smartphone mobile applications, contextual and representational IQ is important since, especially on a small screen of a smartphone, contextual information can be transferred easily with an easy-to-read representational format. Thus, contextual IQ and representation IQ is closely related in Web 2.0 services including mobile applications and we treated them as one dimension of IQ in our analysis.

Furthermore, we placed 'completeness' under intrinsic IQ rather than contextual and representational IQ. Completeness lends itself to an objective measurement that is intrinsic to the information itself (Watts et al. 2009). Jarke and Vassiliou (1997), The Department of Defense (DoD) Guideline for Information Quality (Cykana et al. 1996) and the Ballou and Pazer study (Lee et al. 2002) all state that completeness is placed under the intrinsic IQ category. We also believe that these lines of thoughts stand to reason in Web 2.0 services including SNS.

Fifth, according to the IS diffusion variance model, factors such as technical compatibility, technical complexity (ease of use), and relative advantage play important roles in adoption or infusion of an IS. We adopted technical compatibility, technical complexity (ease of use) as factors under system quality. Many theories consider "flexibility" and "integration" placed under system quality (Bailey & Pearson 1983; DeLone & McLean 2003; DeLone & Mclean 2004; Sedera et al. 2004; Bernroider 2008; Petter et al. 2008). Flexibility and integration are also the parts of needed characteristics in technical compatibility with other Web 2.0 services. In many papers, "ease of use" was placed under service quality (DeLone & McLean 2003; DeLone & McLean 2004; Sedera et al. 2004; Wu & Wang 2006; Petter & McLean 2009). But as mentioned before, service quality can be a subset of system quality (DeLone & McLean 2003). We also believed that "ease of use" in web 2.0 and smartphone applications can be felt by users in overall system performance or user interface which are strongly related with system quality. We therefore thought that it is reasonable to place technical compatibility and technical complexity (ease of use) under system quality.
Further, We replaced relative advantage with two factors, accessibility and user interaction environment, both of which are characteristics of Web 2.0 services themselves. Accessibility is under system quality in Bailey and Pearson (1983), Yang et al. (2005), and especially Kim at al. (2009) in ubiquitous computing system. Consensus and community interaction has been revealed to play an important role in Web 2.0 services (Lim & Lee, 2007). Unlike Wang and Strong's framework, we considered accessibility to be factors under system quality. In addition to that, we placed user interaction environment under system quality of Web 2.0 services, too. It is mainly because the characteristics of smartphone application like mobility, accessibility at any time and place, and quick real-time response of other users are related with the system quality and make users use Web 2.0 services and interact with other users more easily. That means that accessibility mainly comes from Web 2.0 system characteristics not information quality itself.
Combining all the above reasoning, we set the hypothesis in Web 2.0 services as follows.

H1. System quality positively affects the intrinsic IQ of Web 2.0 services.
H2. System quality positively affects the contextual and representational IQ of Web 2.0 services.
H3. System quality positively affects intention to re-use Web 2.0 services.
H4. Intrinsic IQ positively affects intention to re-use Web 2.0 services.
H5. Contextual and representational IQ positively affects intention to re-use Web 2.0 services.

3.2 Variables and items measured

Variables and items measured are listed in Table 1 and 2. We used measures of instruments based on relevant research literature.

Construct	Description	Reference
System Quality (SQ)	Performance of the Web2.0 system	Petter and McLean 2009
Intrinsic Information Quality (IQa)	The quality that information, as a characteristics of output offered by the Web2.0 services has, in its own right.	Wang and Strong 1996 Petter and McLean 2009
Contextual & representational Information Quality (IQb)	The quality of information, as a characteristic of output offered by the Web2.0 services, considered within the context of the work and with the representational format.	
Intention to Re-use (ITR)	Expected future consumption of Web 2.0 services and its output	Petter and McLean 2009

Table 1. Construct and its definition

Construct	Item no.	Item measured	Reference
System quality(SQ)	SQ1	Technology compatibility	IS Diffusion variance model, Agarwal and Prasad 1998, Bradford and Florin 2003
	SQ2	Technology complexity (ease of use)	IS Diffusion variance model, DeLone and McLean 1992, Bradford and Florin 2003, Kim et al. 2004

	SQ3	Accessibility	IS Diffusion variance model, DeLone and McLean 1992 , Replacing Accessibility IQ in Wang and Strong(1996) into SQ (McKinney and Yoon 2002)
	SQ4	User interaction environment	IS Diffusion variance model, Johnson et al. 2006, Al-Natour and Benbasat 2009
Intrinsic Information Quality(IQa)	IQa1	Accuracy	DeLone and McLean 1992, Goodhue 1995, Ballou and Pazer 1995, Wang and Strong 1996, Jarke and Vassiliou 1997, Katerattanakul and Siau1999
	IQa2	Believability	Wang and Strong 1996, Jarke and Vassiliou 1997, Herrera-Viedma et al. 2006
	IQa3	Objectivity/Polarity	Wang and Strong 1996
	IQa4	Completeness	Jarke and Vassiliou 1997
Contextual and representational Information Quality (IQb)	IQb1	Timeliness	DeLone and McLean 1992, Ballou and Pazer 1995, Wang and Strong 1996, Jarke and Vassiliou 1997, Herrera-Viedma et al. 2006
	IQb2	Relevancy	DeLone and McLean 1992, Wang and Strong 1996 Jarke and Vassiliou 1997, Herrera-Viedma et al. 2006
	IQb3	Understandability	DeLone and McLean 1992, Wang and Strong 1996, Herrera-Viedma, Pasi et al. 2006
	IQb4	Conciseness	DeLone and McLean 1992, Wang and Strong 1996, Herrera-Viedma et al. 2006
	IQb5	Vividness	Katerattanakul and Siau 1999
Intention to Re-use (ITR)	ITR1	Willing to use continuously in the future	Moon and Kim 2001, Wang 2008, Bhattacherjee 2001
	ITR2	Recommendations to others	McDougall and Levesque 2000, Moon and Kim 2001, Cheong and Park 2005
	ITR3	Willing to use the service rather than other services	McDougall and Levesque 2000, Bhattacherjee 2001
	ITR4	Satisfaction with the services	Lin et al. 2005, Schaupp et al. 2006, Kettinger and Park 2009, Tang and Chiang 2010

Table 2. Construct and item measured

3.3 Data collection

Prior to data collection for this study, an early version of the questionnaire was checked by a sample of 35 people in Seoul, South Korea. All the adopted indicators utilized a seven Likert scale with higher scores representing more favourable responses. The final data set was obtained through an offline survey. We used SPSS 18.0 for the data analysis and AMOS 18.0 with the maximum likelihood method for the confirmatory factor and structural model analysis. A total of 269 people participated in the survey and the detailed demographic profile is in Table 3. Respondents mainly use PCs (81.4%) and notebooks (73.2%) as information processing terminals. They also use smartphones (39.0%), and other means (5.6%).

Item	Item description	Frequency	Percent	Item	Item description	Frequency	Percent
Gender	Female	84	31.2%	Organization	University students	146	54.3%
	Male	185	68.8%				
Age	Under 20	20	7.4%		Private sector	40	14.9%
	From 21 to 30	134	49.8%		Public sector	71	26.4%
	From 31 to 40	52	19.3%		Others (non-organization)	12	4.5%
	From 41 to 50	55	20.4%				
	From 51 to 60	7	2.6%				
	Above 61	1	0.4%				

Table 3. Sample demographic profile

4 DATA ANLYSIS AND RESULTS

4.1 Data analysis

The confirmatory data analysis for the 17 observable variables was performed. Skewness and kurtosis values confirmed the normality of the data. The Kaiser–Meyer–Olkin measures of sampling adequacy were 0.893. The significant level of Bartlett's test of sphericity was 0.000. We conducted factor analysis using principal axis factoring and Varimax rotation. As a result, four factors such as system quality, intrinsic IQ, contextual and representational IQ and intention to re-use were extracted. All Cronbach's alpha values in our data were more than 0.7 and it indicated good construct reliability.

4.2 Measurement model results

Confirmatory factor analysis (CFA) for an original 4-factor measurement model did not satisfy the condition that the value of average variance extracted (AVE) should be greater than 0.5 (AVE of contextual and representational IQ = 0.495, AVE of intention to re-use = 0.448) and also greater than the square value of correlation coefficient. Therefore we eliminated items step by step, of which squared multiple correlation was severely low. Hence we performed again the data analysis in section 4.1 for 15 observable variables and conducted CFA for the adjusted four factor measurement model. We obtained satisfactory results. The Kaiser–Meyer–Olkin measures of sampling adequacy were 0.890. The significant level of Bartlett's test of sphericity was 0.000. These factors were extracted from our model as predicted.

The chi-square value of the measurement model was significant (chi-square =260.64.73, d.f. = 84, p = 0.000), and other fit indices showed a good model fit (CFI = 0.915, GFI = 0.89, AGFI = 0.842, NNFI = 0.893, RMSEA = 0.089 and SRMR = 0.0580). As in Table 4, the construct reliabilities for all observable variables was assessed in terms of Cronbach's alpha resulted in values greater than 0.7. The composite reliability and convergent validity were measured above the recommended 0.7 (Hair et al., 1998) and 0.5 thresholds respectively. AVE was used as measure of convergent validity.

Constructs	Cronbach's alpha	Composite reliability	AVE
System quality (SQ)	0.84	0.76	0.56
Intrinsic quality (IQa)	0.87	0.83	0.65
Contextual and representational quality (IQb)	0.80	0.76	0.51
Intention to re-use (ITR)	0.76	0.77	0.52

Table 4. Cronbach's alpha, composite reliability and average variance extracted

Table 5 showed that the squared root of AVE for each construct (the numbers in parenthesis) was greater than the corresponding inter-construct correlations. We, therefore, concluded overall that the measures were valid.

	System quality (SQ)	Intrinsic quality (IQa)	Contextual & representational Quality (IQb)	Intention to re-use (ITR)	AVE
System quality (SQ)	(0.75)				0.56
Intrinsic quality (IQa)	0.62	(0.81)			0.65
Contextual and representational quality (IQb)	0.69	0.67	(0.71)		0.51
Intention to re-use (ITR)	0.71	0.60	0.66	(0.72)	0.52

*The numbers in parenthesis are the square root of each AVE value

Table 5. Correlations and average variance extracted in the measurement model

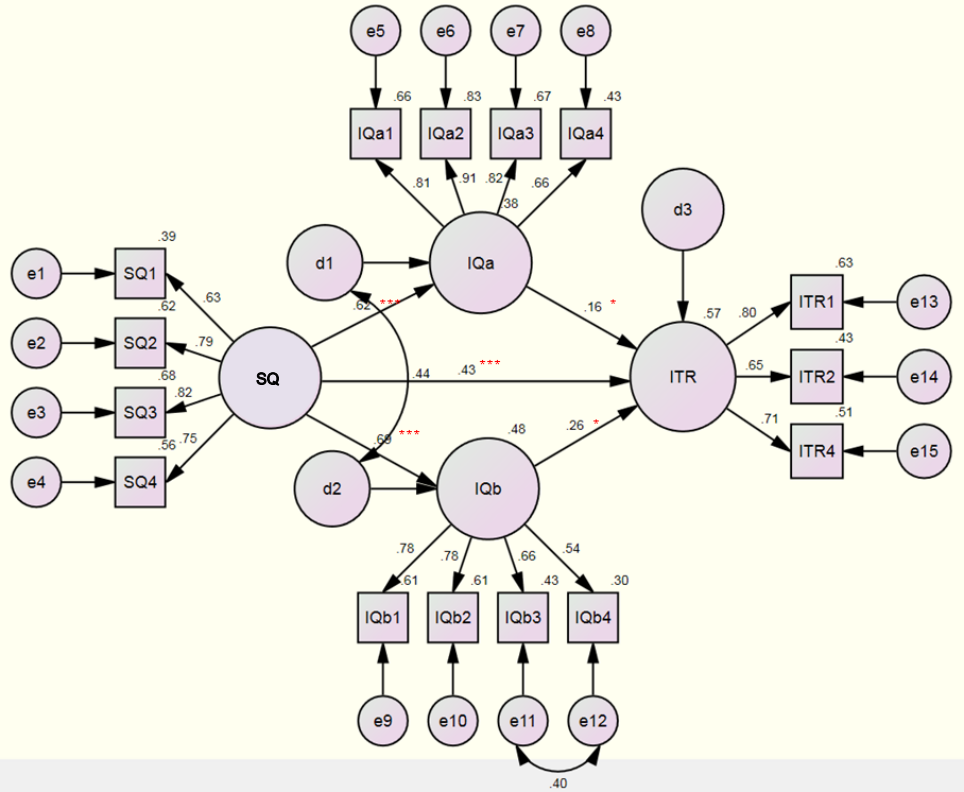
4.3 Structural model results

After estimating the initial structural model, it was desirable that some of the fit measures could be enhanced. Therefore the test for a revised structural model was conducted and the fit of the two models are revealed in Table 6.

Structural model	Chi-square	Degrees of Freedom	*p*	CFI	GFI	AGFI	NNFI	RMSEA	SRMR
Initial model	286.07	85	0.000	0.903	0.882	0.834	0.880	0.094	0.075
Revised model	224.17	83	0.000	0.932	0.905	0.862	0.914	0.080	0.055

Table 6. Overall fit measures for initial and revised model

The revised structural model showed an acceptable fit with Chi-square = 224.17, degree of freedom=83, p=.000, CFI=0.932, NNFI=0.914, RMSEA=0.080, and SRMR=0.055 (Browne & Cudeck, 1993). A ratio of chi-squared to the degree of freedom of no more than four-to-one is considered a good fit to the model (Matsueda 1982). The ratio of our model is 2.7 (< 4). In general, the values of CFI, NNFI, GFI and AGFI indicate a better fit if they are more than 0.9 each. RMSEA values generally range from zero to 0.08, and values close to zero mean a better fit. Hair et al. (1998) suggested that when sample size exceeds 250 and the number of observable variables ranges from 12 to 30, as is the case of our model, the following conditions should be met: CFI or NNFI $\geq$0.92, SRMR $\leq$0.08, and RMSEA < 0.07. The result of fit measure of our model satisfied their criteria except for RMSEA. According to Browne and Cudeck (1993), values of RMSEA in the range of 0.05 to 0.08 indicate a fair fit (Hu and Bentler 1999).



* Significant at p-value < 0.05 with one-tailed test
* * *Significant at p-value < 0.01 with one-tailed test

Figure 3. The revised structural model and the estimation result

Therefore we concluded that our model showed a fair fit. Standardized path coefficients for the revised structural model are shown in Figure 3 and standardized total, direct and indirect effects are listed in Table 7.

Predictor	Dependent variable	Total effect	Direct effect	Indirect effect
System Quality (SQ)	Intrinsic IQ (IQa)	0.620	0.620	-
System Quality (SQ)	Contextual and representational IQ (IQb)	0.693	0.693	-
Intrinsic IQ (IQa)	Intention to re-use (ITR)	0.162	0.162	-
Contextual and representational (IQb)	Intention to re-use (ITR)	0.260	0.260	-
System Quality (SQ)	Intention to re-use (ITR)	0.706	0.425	0.281

Table 7. Standardized direct, indirect, and total effects

The structural model showed support for the all hypothesis. System quality is positively correlated to intrinsic IQ (Hypothesis 1) and contextual and representational IQ (Hypothesis 2), so an increase in the quality of Web 2.0 system enhances both intrinsic IQ and contextual and representational IQ. System quality is positively correlated to intention to re-use (Hypothesis 3), so an increase in the quality of Web 2.0 systems also causes an increase in the intention to re-use Web 2.0 services. Both intrinsic IQ and contextual and representational IQ are also positively correlated to intention to re-use (Hypothesis 4, 5), so an increase in intrinsic IQ triggers an increase in the intention to re-use of Web 2.0 services and enhances contextual and representational IQ does too.

Hypothesis	Support
H1. System Quality (SQ) positively affects intrinsic information quality (IQa) of Web 2.0 services.	Yes***
H2. SQ positively affects Contextual and representational quality (IQb) of Web 2.0 services.	Yes***
H3. SQ positively affects intention to re-use of Web 2.0 services.	Yes***
H4. IQa positively affects intention to re-use of Web 2.0 services.	Yes*
H5. IQb positively affects intention to re-use of Web 2.0 services.	Yes*

* Significant at p-value < 0.05 with one-tailed test

* * *Significant at p-value < 0.01 with one-tailed test

Table 8. Hypothesis test results

In addition, we also found that compatibility with other services and user interaction environment have their own impact and roles as factors under system quality. Observable variables have compatibility with other services (SQ1), ease of use (SQ2), accessibility (SQ3), and user interaction environment (SQ4) have significant standardized regression weights in Table 9. It can also be pointed out that users prefer contextual IQ to representational IQ. Observable variables timeliness (IQb1), relevance (IQb2), understandability (IQb3) and conciseness (IQb4) have significant standardized regression weights in Table 9, too.

Observable Variables	Standardized Regression Weights	Observable Variables	Standardized Regression Weights
Compatibility with other services (SQ1)	0.63	Timeliness (IQb1)	0.78
Ease of use (SQ2)	0.79	Relevance (IQb2)	0.78
Accessibility (SQ3)	0.82	Understandability (IQb3)	0.66
User interaction environment (SQ4)	0.75	Conciseness (IQb4)	0.54

Table 9. Standardized Regression Weights of SQ and IQb

5 DISCUSSIONS

The path coefficients from system quality to intrinsic IQ and contextual and representational IQ are 0.62 and 0.69 respectively. Accordingly system quality exerts slightly more impact on contextual and representational IQ than on intrinsic IQ. We believe the difference can be interpreted in the way that the characteristics of Web 2.0, such as active user interactions, reinforce contextual and representational IQ more than intrinsic IQ. The path coefficient from contextual and representational IQ to intention to re-use is 0.26, and that from intrinsic IQ to intention to re-use is 0.16. Contextual and representational IQ impacts more on intention to re-use than intrinsic IQ does. From the fact that system quality exerts more impact on contextual and representational IQ than on intrinsic IQ (0.69 > 0.62) and that contextual and representational IQ yields more impact on intention to re-use than intrinsic IQ does (0.26 > 0.16), we discovered that the total effect from system quality to intention to re-use via contextual and representational IQ (0.18 = 0.69*0.26) is larger by 80 percent than that from system quality to intention to re-use via intrinsic IQ (0.10 =0.62 * 0.16). It can be concluded, thus, that contextual and representational IQ plays a more important role than intrinsic IQ in Web 2.0 service usage.

As mentioned earlier, the direct effect from system quality to intention to re-use is 0.43 and the indirect effect is 0.28 (= 0.18 + 0.10). Therefore, the total effect from system quality to intention to re-use amounts to 0.71, which far exceeds the total effect (in this case, direct effect only) from intrinsic IQ to intention to re-use, or either that from contextual and representational IQ and intention to re-use. It means that users place more weight on system quality than intrinsic IQ or contextual and representational IQ in deciding whether to re-use Web 2.0 services. It suggests a guideline for practitioners to consider when designing and operating Web 2.0 services.

All factors under system quality, such as compatibility with other services (SQ1), ease of use (SQ2), accessibility (SQ3), and user interaction environment (SQ4) are measured more than 0.6. The weight of accessibility is the highest and that of compatibility with other services is the lowest. Those of ease of use and user interaction environment are in the middle. We discovered that all factors have significant weight on system quality, even though compatibility with other services has the lowest standardized regression weight among all factors under system quality. Users are more influenced by other system factors for Web 2.0 services than compatibility. The role of compatibility with other services compared to other factors has room for further research. These findings, however, signify that both compatibility with other services and user interaction environment with two other factors should be considered important in operating Web 2.0 services.

Among factors under contextual and representational IQ, the standardized regression weights of timeliness (IQb1) and relevance (IQb2) are higher than those of understandability (IQb3) and conciseness (IQb4). Timeliness and relevance represent the contextual IQ, whereas understandability and conciseness do to representational IQ. In Web 2.0 services, it can be inferred that users consider contextual IQ more important than representational IQ.

Among factors under intention to re-use, 'willing to use the service rather than other services' (ITR3) was excluded in our analysis due to lack of explanation power. This factor means the lock-in effect in a practical sense. Our empirical test, however, indicates that users are not strongly bound with the current services they use. This fact shows that users have a tendency to experiment with newly introduced Web 2.0 services on a trial base if needed. Users seem to adopt the 'try first and then decide' strategy in this competitive industry environment in which new and similar services are being launched incessantly.

6 CONCLUSION

We explored the properties of mobile/fixed Web 2.0 services including SNS and the relationship among system quality, information quality, and intention to re-use for these services. Primarily considering the classification of information quality by Wang and Strong (1996, 2002) and Herrera-Viedma et al. (2006), we reviewed four dimensions of information quality and rearranged them into two categories, that is, intrinsic IQ and contextual and representational IQ in Web 2.0 services. Based on the socio-technical approach, the Updated IS Success Model and IS diffusion Variance Model, we

established the SEM model to test our hypothesis. Empirical analysis shows that all the paths in our model proved to be significant.

The theoretical contributions of this research are as follows: first, we revealed that system quality affects information quality positively for Web 2.0 services. We also found that well designed and operated Web 2.0 services' system quality induces both intrinsic IQ and contextual and representative IQ to be enhanced significantly. The direct effect of service or system quality on information quality has been rarely studied. Revealing the impact of system quality on sub-categorized information quality is the major contribution of our research. Second, we revealed that contextual and representational IQ plays a more important role in intention to re-use Web 2.0 services than intrinsic IQ does. Users of Web 2.0 services, including SNS and smartphone mobile applications, can access a lot of information sources and positive or negative following comments, responses or revised information in no time. Hence it seems that users prefer contextual and representational information to intrinsic information, even though they also give importance to the latter. Third, we also recognized that user interaction environment and compatibility with other services are one of main factors under system quality of Web 2.0 services. We reasoned that these two factors are important to users since, through those factors, users can obtain and transfer various and improved sources of information among diverse Web 2.0 services.

For managerial implications, in order to increase re-usage of Web 2.0 services, practitioners should give priority firstly to system quality, secondly to contextual and representational IQ, and lastly to intrinsic IQ. In system quality, the three factors of ease of use, accessibility, and user interaction environment should be considered as the utmost of importance in designing or operating Web 2.0 services. Compatibility with other services is also treated importantly, although it has a little lower explanatory power in system quality. In contextual and representational IQ, practitioners should ensure that contextual information which is timely and relevant can be easily circulated in an understandable and concise format through their Web 2.0 services. It is also revealed that there is little lock-in effect in Web 2.0 services. Due to this fact, practitioners need to upgrade their services as deliberately and frequently as possible, when necessary, in order to keep a competitive edge of their services.

This research has the following limitations. First, survey respondents were neither experts nor heavy users of Web 2.0 services, including smartphone mobile internet applications. The time when this survey was conducted, the end of 2010, was eleven months after the introduction of iPhones in South Korea. Some respondents heavily used Web 2.0 services and mobile internet applications such as Twitter and SNS, but others did not. If the survey is conducted when smartphones and mobile internet applications are more widely adopted in the market, or if survey targets are narrowed down to experts or heavy users of Web 2.0 services, it may produce more meaningful results. Second, the survey questioned all Web 2.0 services as a totality, not for each individual service. This is because we wanted to reveal the effects among system quality, information quality and intention to re-use in all Web 2.0 services. If our approach would be applied to each individual Web 2.0 service, it is expected to yield more detailed results for each service.

For further research, we believe that information distortion and correction process in Web 2.0 services needs to be studied. Dealing with this issue will help understanding one of the major aspects which Web 2.0 services, including smartphone mobile applications, bring to our society.

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