The Social Networking Application Success Model: An Empirical Study of Facebook and Twitter

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ABSTRACT

Social networking applications (SNAs) are among the fastest growing web applications of recent years. In this paper, we propose a causal model to assess the success of SNAs, grounded on DeLone and McLean's updated information systems (IS) success model. In addition to their original three dimensions of quality, i.e., system quality, information quality and service quality, we propose that a fourth dimension - networking quality - contributes to SNA success. We empirically examined the proposed research model with a survey of 168 Facebook and 149 Twitter users. The data validates the significant role of networking quality in determining the focal SNA's success. The theoretical and practical implications are discussed.

1. Introduction

Social networking applications (SNAs) have dramatically changed the ways in which people communicate and interact with each other. Among the younger generation in particular, SNAs are a popular communication mechanism (Murnan, 2006). SNA members often form different groups in order to provide information, emotional support, material aid and social identity (Wellman, 2005). Although each SNA has its own mechanisms to help people build social networks and relations with others, all SNAs share the following common characteristics. They are web-based applications that can be used to form a social networking group, enabling people to interact and share information with one another. In the last few years, SNAs have become increasingly popular, as demonstrated by their continuous growth and the richness of information content. According to Alexa's traffic analysis on June 22, 2012, Facebook and Twitter were ranked as the 2nd and 8th most popular sites in the world, respectively, and among the most visited SNAs.

Despite the surge of popularity that these SNAs have experienced, research on SNAs has either focused on specific SNA functions or has taken a case study approach into one specific SNA. There has been a lack of theoretically driven empirical research to measure why SNAs are successful. We

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should be concerned about the success of SNAs because of their influence on our social lives and their potential to nurture new opportunities in business, education and politics. Therefore, there is a need to establish a formal measurement model to capture the factors that contribute to SNA success.

A large number of studies have described the key elements that contribute to the success of an information system (IS). Among them, the IS success models (ISSMs) of DeLone and McLean (1992, 2003) have received considerable attention from academics and practitioners, providing a theoretical foundation for IS research on such topics as enterprise wide systems (Bernroider, 2008), knowledge management (Wu & Wang, 2006) and electronic commerce (Wang, 2008). Unlike prior research, we argue that an ISSM related to the social network domain requires conceptual modification given SNAs' social networking characteristics. Specifically, the typical functions of SNAs which are distinct from other IS applications such as knowledge management systems or electronic commerce platforms, include information exchange of short messages and expanding social contacts, and the capability for users to present themselves easily. These characteristics appear to have contributed to SNAs' success. Thus, the objective of this study is both to conceptualize networking quality and to examine whether networking quality provides a significant and new explanation for SNA success beyond the DeLone and McLean's (1992, 2003) ISSMs.

Following this introduction, we review the literature and summarize our theoretical basis for the proposed SNA success model. We argue that social networking quality is a new dimension that should be included in the ISSMs. We next justify the theoretical model in detail. Following a description of the survey method and data analysis, we discuss the findings and make suggestions for future research. We conclude the paper with implications and contributions.

2. Literature Review

2.1 Social Networking Applications

Following Garton, Haythornthwaite, amd Wellman (1997), we define a social network application (SNA) as an online platform enabling individual users to interact and interconnect through certain social relationships, such as friendship, co-working or information exchange. The underlying nature of SNAs is similar to traditional social networks formed by means of face-to-face conversations, telephone communication or mail interaction. However, this new form of socialization requires the existence of SNAs such as Facebook and Twitter, where individual users can present themselves, contact friends and access information sources through one specific social network. This form of socialization is popular because of its capability to overcome the time and space limits of traditional networks (Kavanaugh et al., 2005; Lea et al., 2006) while at the same time the actual acceptance and usage of social networks are also related to the user's previous exposure experience in technology (Holzinger, Searle, & Wernbacher, 2011).

The crux of a SNA's success is its capability to enable interactions between individual users on a mass scale within a connected online network. In order to achieve this capability, SNAs offer the functionality of identity management (i.e. the representation of one individual actor in the form

of a profile in a social network) and enable each user to keep in touch with other members (through the exchange of messages across the social network) (Richter & Koch, 2008). Therefore, researchers have invested significant efforts in mining the public opinions and sentiments in social networks (Petter, DeLone, & McLean, 2008). Meanwhile, most social networking researchers consider identity management (Boyd & Heer, 2006; Richter & Koch, 2008) and information exchange (Bouman et al., 2007; Richter & Koch, 2008) to be the key characteristics of SNAs. Specifically, identity management allows the users of a SNA to construct a social identity to present to their counterparts in the focal social network in the form of a personal profile. Information exchange allows connected social actors to exchange information directly (via messages) or indirectly (via photos and blogs) in a semi-structured way (Chou & Chou, 2009). Richter and Koch (2008) summarize four other basic functionalities of SNAs, viz.: expert finding (i.e., using expert search as a way to identify knowledge); context awareness (i.e., being contextually aware of other people who share similar interests and are employed by the same organization); contact management (i.e., maintenance of the digital personal network by tagging people, allowing access or restricting access to profiles); and network awareness (i.e., the awareness of activities by informing people about one's current status or changes). Typical examples of SNAs with the above six characteristics include Twitter, Facebook and LinkedIn. Richter and Koch's (2008) conceptual discussion has established a theoretical basis upon which the networking characteristics of SNAs can be further examined.

2.2 DeLone and McLean's IS Success Models

DeLone and McLean's (1992, 2003) ISSMs provide a means of measuring success - a complex dependent variable in IS research. The updated model (DeLone & McLean, 2003) includes six interrelated dimensions of IS success: system quality, information quality, service quality, use, user satisfaction and net benefit (see Figure 1). This model provides a scheme for classifying the multitude of IS success measures and suggests the temporal and causal interdependencies between the six dimensions. Information quality, service quality and system quality should be measured or controlled for, because separately or together they will affect subsequent use and user satisfaction. Use and user satisfaction are closely interrelated in the proposed model. Positive experience with use will lead to greater user satisfaction. Similarly, increased user satisfaction will lead to increased use.

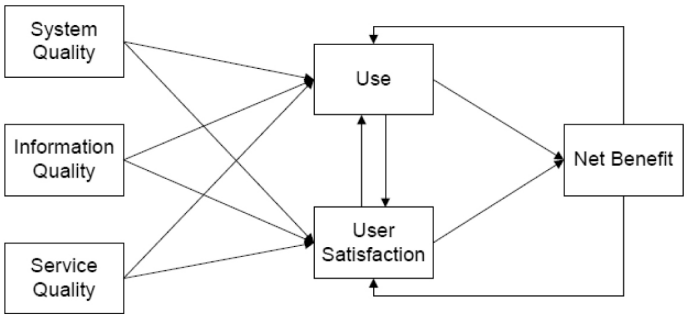

Fig. 1. Updated Information Systems Success Model (DeLone & McLean, 2003)

As a result of use and user satisfaction, certain net benefits will occur and will in turn influence and reinforce subsequent use and user satisfaction. The DeLone and McLean's (1992, 2003) ISSMs thus incorporate both *process* and *causal* relationships among the interrelated constructs.

Although DeLone and McLean (2003) proposed an updated version of their ISSM, it has only received limited support in empirical studies where it was tested in various contexts. Petter, DeLone, and McLean (2008) found that tests of the significance of the constructs suggested in ISSMs received mixed, even contradictory, findings. For example, Halawi, McCarthy, and Aronson (2008) provided evidence for the insignificant influence of service quality in the use of Enterprise Resource Planning (ERP) systems or Knowledge Management Systems (KMS). Similarly, Wu and Wang (2006) argued that service quality is not a good measure for a KMS because it serves as an independent variable rather than an indicator of IS success. Therefore, they dropped service quality from their research model. Wu and Wang (2006) also argued that although system use is a good proxy for IS success, it is not mandatory to model the path between system quality and system use. In the literature on ISSMs, the feedback loops (i.e., from use to user satisfaction; from net benefit to use; and from net benefit to user satisfaction) were seldom empirically studied.

Following Petter and Fruhling (2011), we searched for related studies in online databases (e.g., EBSCO, ABI/INFORM, Science Direct and the Web of Knowledge) using the keywords 'information systems success', 'success model', 'success measurement', 'DeLone and McLean', and 'IS effectiveness'. A total of 856 conceptual and empirical papers, published from 2008 to June 2012, were identified. We classified 53 of these studies as 'quantitative empirical research with mixed statistical evidence' on the efficacy of the DeLone and McLean's (1992, 2003) ISSM in different research contexts. We summarize these 53 studies in Appendix A (at the individual level) and in Appendix B (at the organizational level). Appendix C is a bibliography of these 56 empirical studies.

3. Conceptual Development

Identification of the Research Gap and Conceptualization of "Networking Quality"

Given the mixed empirical results for the revised ISSM, Petter and Fruhling (2011) called for more empirical research to establish the strength of interrelationships across different contextual boundaries. Considering that the main stream of research on ISSMs focuses on utilitarian IS (such as e-learning systems, ERP systems, KMS, and e-commerce systems), the need for empirical studies on hedonic IS (such as gaming and social networking) is highlighted, especially in the area of social networking (Petter & Fruhling, 2011). However, according to our literature review, no studies have been found that apply DeLone and McLean's ISSMs to measure a SNA's success.

Following Petter and Fruhling (2011), we contend that ISSMs should be applicable to the social networking context. *System quality of a SNA* refers to the application's reliability, ease of use and response time. *Service quality of a SNA* refers to the overall support delivered by the service provider. *Information quality of a SNA* captures the completeness, relevance and ease of understanding of web content. While these three dimensions of quality are necessary to an evaluation of the experience of using a SNA, including user satisfaction, they are not sufficient, since other core elements may also

contribute to SNA success. More precisely, the reason why an individual uses a SNA is to expand his/her social network and to improve the quality of social network lives with broader and stronger online connections with friends, colleagues and collaborators (Ganley & Lampe, 2009; Garton, Haythornthwaite, & Wellman, 1997). It is this social networking dimension that has not been captured in existing ISSMs, though this does not diminish the importance of system quality, information quality and service quality to system use and user satisfaction. As noted by many researchers (Ganley & Lampe, 2009), social capital, in terms of the information exchanged and the social relationship built in the SNAs, is both the key indicator and the driver for people to use a SNA. IT enables registered members to form many weak ties across different social groups, as well as strong personal ties with close friends and collaborators through daily updates, information provision, emotional support, material aid and social identity (Wellman, 2005). From the design perspective, a SNA's successful networking functions include identity management and information exchange, expert location, context awareness, contact management, and network awareness (Richter & Koch, 2008). Together, these six functions constitute what we term as the *networking quality of a SNA* in this study. Measuring SNA success requires these six functions of networking quality to be captured. Given this research gap, the purpose of this study is to formalize the above conceptualization of networking quality and to provide empirical evidence for the significance of this construct in the context of SNA.

In addition to the importance of the networking aspect of SNAs, the potential to utilize SNAs in various contexts also highlights the need to empirically examine SNA success. Successful SNAs (such as Twitter, Facebook, LinkedIn, and SecondLife) play an important role in business, politics, education, philanthropy, social capital, and youth culture. A wide variety of organizations also make use of SNAs as they create profiles to advertise, sell, and promote their products and services. Empirical research on examining the success factors of SNAs can help identify the most effective design functions of SNAs and provide both theoretical and practical implications for organizations and institutions on the related aspects of collaboration, discussion, and networking.

3.1 An SNA Success Model

We employ DeLone and McLean's (2003) updated ISSM to measure the success of SNAs, which we term as the SNA success model. Although empirical studies of DeLone and McLean's (2003) ISSM have produced inconsistent results in different research contexts (see Appendices 1 and 2), we expect system quality, information quality and service quality to play an important role in driving SNA success. Therefore these three constructs serve as independent variables in the SNA success model. As argued above, the networking functions of SNAs are important characteristics that can render an SNA the capability to establish both weak and strong ties among individual users in different social groups within one specific SNA such as Twitter or Facebook. We thus propose that the conceptual model of SNA success should include networking quality as a fourth independent variable of the ISSM.

A number of alternative approaches to the ISSM's original feedback loop (i.e., the influence of net benefits on user satisfaction and use as shown in Figure 1) have been proposed. Seddon

(1997) contended that the mixed process and causal explanation of ISSM introduces confusion. He further argued that system use must precede impacts and benefits. In addition, some scholars (Baroudi, Olson, & Ives, 1986; Lee, Choi, & Kang, 2009) argue that user satisfaction can cause system use rather than vice versa. As in past empirical studies (Lee, Choi, & Kang, 2009; Wang & Liao, 2008), our research is cross-sectional in nature and therefore we do not measure more than a single usage of SNAs. Given these reasons, the feedback loop of the ISSM has been omitted in the current study. We depict the whole research model in Figure 2. The definitions of constructs are summarized in Table 1. We provide detailed justifications for the proposed hypotheses in the following sub-sections.

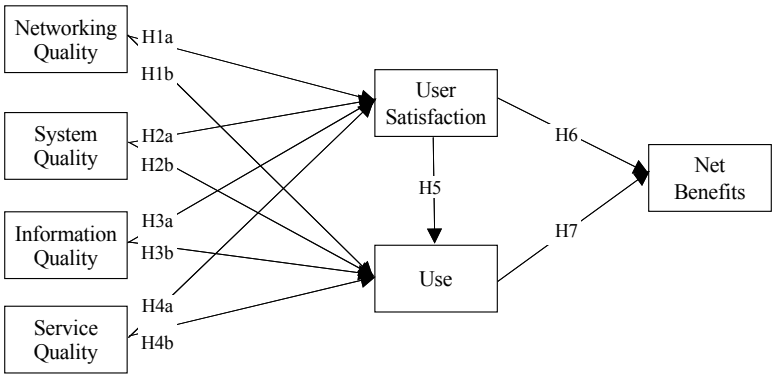

Fig. 2. The SNA Success Model

Table 1. Constructs and Definitions

Construct	Definition	Adapted from:
Networking Quality	An SNA user's perception of the quality of functions (of the focal SNA) for the purposes of social networking, information exchange, identity management, contact management, expert searching, context awareness and network awareness.	(Ganley & Lampe, 2009; Garton, Haythornthwaite, & Wellman, 1997; Richter & Koch, 2008; Wellman, 2005)
System Quality	An SNA user's perception of the quality (of the focal SNA) of technical performance in terms of ease-of-use, stability, user friendliness, and response time.	(DeLone & McLean, 2003; Wang, 2008; Wu & Wang, 2006)
Information Quality	An SNA user's perception of the quality (of the focal SNA) of the extent to which SNA-provided information fits use, is important, helpful, meaningful, practicable and clear.	(DeLone & McLean, 2003; Wang, 2008; Wu & Wang, 2006)
Service Quality	An SNA user's perception of the quality (of the focal SNA) related to customer service and support to the extent that corresponding administrators or customer service staff provide support when they promise to do, their willingness to help, their knowledge to answer questions and their understanding of users' specific needs.	(DeLone & McLean, 2003; Wang, 2008; Wu & Wang, 2006)
User Satisfaction	An SNA user's level of satisfaction with the extent that the focal SNA both meets the user's social networking needs and achieves a satisfactory level with respect to efficiency and effectiveness	(DeLone & McLean, 2003; Wang, 2008; Wu & Wang, 2006)

Construct	Definition	Adapted from:
Use	An SNA user's use of the focal SNA to make and maintain contact with friends, as well as share information and knowledge.	(DeLone & McLean, 2003; Java et al., 2007; Wang, 2008; Wu & Wang, 2006)
Net Benefits	An SNA user's perception with respect to the benefits brought by the focal SNA in terms of expanding the user's social networks, acquiring desired knowledge and information, the reduction of time and efforts to exchange information and the improvement of the user's social life.	(DeLone & McLean, 2003; Java et al., 2007; Wang, 2008; Wu & Wang, 2006)

3.2 The Significance of Networking Quality in Measuring SNA Success

An SNA, such as Facebook or Twitter, focuses on the building and reflecting of social networks or relationships among people such as those who share interests and/or activities (Richter & Koch, 2008). The provision of quality networking functions is one of the major contributors to SNA success. Although each SNA provides a unique set of specific functionalities and characteristics, they all share the same social networking objective, operationalized through the functions of identity management and information exchange, expert locating, context awareness, contact management network awareness. The success of the social web is premised on enabling users to connect with others in a traditionally impossible way. Twitter, technically a message routing system (Bouman et al., 2007), connects a global community of people by providing a platform for users to influence what is being socialized and talked about around the world. Facebook, on the other hand, gives "people the power to share and make the world more open and connected". In a nutshell, the popularity of SNAs such as Twitter and Facebook is largely attributable to the presence of the users' friends and acquaintances that also use the focal SNA, thus creating the networking effects (Cheung & Lee, 2010; Li, Liu, & Bandyopadhyay, 2010). Unlike utilitarian IS applications such as ERP systems, KMS and DSS, SNAs are primarily designed for social purposes with the key characteristic of quality networking. For example, Twitter and Facebook enable people to keep in touch with their friends, satisfying an inherent human need for social interaction (Thibaut & Kelley, 1959). The open and spontaneous interactions that occur on SNAs such as Twitter and Facebook initiate the process of keeping each other updated, which in turn helps to build trust and reinforce friendship with satisfying experiences (Bouman et al., 2007), leading to a virtuous cycle of SNA usage. We thus hypothesize that:

H1a: A SNA's networking quality is positively associated with user satisfaction.

H1b: A SNA's networking quality is positively associated with SNA use.

3.3 The Significance of System Quality in Measuring SNA Success

System quality is a major system success criterion (DeLone & McLean, 1992, 2003). Specifically, system quality refers to system characteristics, focusing on the technical aspect of an information system (Delone & Mclean, 2003). It is concerned with whether there are errors in the system, the ease of use, the response time and stability of the system (Delone & Mclean, 1992, 2003; Wu

& Wang, 2006). Similar to the ISSM, the technology acceptance model (Davis, 1989) also proposed that system attributes such as friendliness have a significant impact on a user's satisfaction level. Although these scales of system quality are often used to measure utilitarian IS such as KMS, DSS, and ERP systems, they are also equally applicable to the measure of SNA success, as explained below.

SNAs operate by ensuring the rapid relay of messages between millions of online users on a web-based platform or other electronic devices such as iPhones and iPads. Therefore system performance requirements are significant. An SNA needs to be easy to use and offer a swift response time if it is to retain the loyalty of its members and ensure that information content is constantly created. When tens of millions of users are online concurrently, these SNAs provide an easy way for people to seek contacts, form friendships on sites such as Facebook or coordinate actions and lives with each other via the message routing platforms such as Twitter. Poor usability and slow response times can discourage use of such SNAs and lead to user dissatisfaction. System technical performance weaknesses will drive users away. We thus hypothesize that:

H2a: An SNA's system quality is positively associated with user satisfaction.

H2b: An SNA's system quality is positively associated with SNA use.

3.4 The Significance of Information Quality in Measuring SNA Success

Information quality has long been a focus for IS researchers eager to measure system quality (DeLone & McLean, 1992; DeLone & McLean, 2003). Unlike previous research, where information quality was primarily measured in the form of reports, in this study we examine to what extent the information exchanged in social networks is updated, meaningful and helpful for users' social lives. Popular SNAs, such as Twitter and Facebook, keep users informed with what matters most to them on a continuous basis, and so help them to discover what might matter most in the immediate future. SNA success is related to the user's ability to leverage influence within their social networks, to act as "contactors" and "connectors" between people and information, and in turn to build social capital.

We argue that the surge of popularity in SNAs is due to the latent capacity to enable users to share information and ideas in a previously impossible way. For example, Twitter was described as enabling "a continuous flow of short updates on your life" (Bouman et al., 2007). These SNAs shape users' social networks with intensive targeted information. SNAs allow users to contact the people they know and to access needed information sources. For example, Twitter was a key media channel in the first few hours after the Beichuan earthquake in 2008 before regular news coverage was possible (Li & Rao, 2010). Twitter was also an instrumental communication channel in the wave of popular uprisings across the Middle East from 2009 to-2012, linking protesters to the outside world. Twitter has also been associated with the recent Flashmob phenomenon (Tonkin, Pfeiffer, & Tourte, 2012). People are thus assembled by SNAs which provide meaningful information that is related to a specific context. The more accurate, updated, meaningful and useful the information presented through these SNAs, the more people will be engaged and able to participate, and so continue to use these SNAs in their lives. SNAs thus help to satisfy a human need for information. After using these SNAs for some time, SNA members may form a sophisticated social network, which in turn

engages the users in a virtuous cycle with satisfied experiences. Therefore, we hypothesize that:

H3a: An SNA's information quality is positively associated with user satisfaction.

H3b: An SNA's information quality is positively associated with SNA use.

3.5 The Significance of Service Quality in Measuring SNA Success

Service quality refers to the overall support delivered by the SNA service provider (DeLone & McLean, 2003). We argue that this dimension is important for an SNA because users are customers, not employees. This dimension of quality measures the service provider's responsiveness and technical competence. Customer satisfaction is based on experience with the service. If a customer is dissatisfied with the service encounter, this will negatively influence the overall product and service quality evaluation (Cronin, Brady, & Hult, 2000; Lam et al., 2004). Therefore poor user support will translate into lost customers and sales (DeLone & McLean, 2004).

SNA success depends on the information generated and exchanged by users. This means that customer support is less important than in other enterprise-wide IS. However, SNAs that provide a better quality of service to users are likely to be more competitive and so outperform other SNA providers. A simple piece of information, such as a phone number or an email address, that can be leveraged to reach the customer service department may help users to solve problems quickly before a situation deteriorates. If SNA users would like to inquire about issues with their own accounts, or communicate with the customer service department by email, the perceived ignorance of the SNA provider or its customer service staff will negatively influence user satisfaction. We thus propose that:

H4a: An SNA's service quality is positively associated with user satisfaction.

H4b: An SNA's service quality is positively associated with SNA use.

3.6 User Satisfaction, Actual Use and the Net Benefits of SNAs

DeLone and McLean (1992, 2003) have suggested close relationships among user satisfaction, actual use and net benefits with a feedback loop in the ISSM (see Figure 2). They also explain that "'use' must precede 'user satisfaction' in a *process* sense, but positive experience with 'use' will lead to greater 'user satisfaction' in a *causal* sense. Similarly, increased 'user satisfaction' will lead to increased 'intention to use', and thus 'use'" (DeLone & McLean, 2003). In this study, we establish a conceptual *causal* model, instead of a *process* model, to investigate the success of SNAs. In order to test the loop between use, satisfaction and net benefits in DeLone and McLean's (2003) updated ISSM, we propose that user satisfaction leads to the use of SNAs, and subsequently enhances the perceived net benefits of using SNAs. This causal view is consistent with most studies on ISSMs, such as those on electronic commerce (Wang, 2008) and knowledge management (Wu & Wang, 2006), which suggest that user satisfaction leads to the actual usage of a system. Indeed, we argue that user satisfaction is a key element that determines the frequency of SNA use. When a user considers that a SNA can meet his/her social networking needs, it is more likely that the user will continue using the SNA. When the efficiency and effectiveness of the SNA can satisfy the user's requirements, the user will use the SNA more frequently. These arguments are in line

with literature that has verified satisfaction as a reliable predictor of reuse (Cronin, Brady, & Hult, 2000; Lam et al., 2004). We therefore hypothesize that:

H5: User satisfaction will positively affect SNA use.

Net benefits are the ultimate outcome measures of IS success in the causal view of an ISSM (see Figure 1). DeLone and McLean suggest that "as a result of the use and user satisfaction, certain net benefits will occur" (DeLone & McLean, 2003). From the user point of view, the net benefits of using SNA involve the expansion of the user's social network and improvements to the quality of social life. This is the fundamental and ultimate design outcome of SNA - strengthening and expanding users' social networks by connecting people in the digital social networking site (Ganley & Lampe, 2009; Garton, Haythornthwaite, & Wellman, 1997). We contend that user satisfaction is the one of the key determinants influencing users' overall evaluation of the net benefits of using an SNA. Meanwhile, the increased usage of a SNA will expand a user's social networks. Exchanging messages and useful information with friends, co-workers and participants in the same interest groups can increase the bonds among users. The use of SNAs can also enable people to share information with less time and effort. On the other hand, it is very likely that a dissatisfied SNA user neither provides a positive evaluation of a SNA nor appreciates the aforementioned net benefits of the SNA. Consistent with DeLone and McLean (2003), we therefore propose that the use of and satisfaction with an SNA will lead to the user's positive evaluation of the net benefits of using the SNA and test the following hypotheses in the context of SNAs.

H6: User satisfaction will positively affect the perceived net benefits of SNA.

H7: The use of an SNA will positively affect the perceived net benefits of SNA.

4. Methodology

We followed existing guidelines (Lewis, Templeton, & Byrd, 2005; Straub, Boudreau, & Gefen, 2004) to develop the measures of the constructs in the proposed SNA success model, with most items adapted from existing research. Specifically, system quality, information quality and user satisfaction are measured with scales adapted from a study about knowledge management success (Wu & Wang, 2006), which was based on the original ISSM (DeLone & McLean, 1992). Service quality is measured with scales adapted from the SERVQUAL instrument (Kettinger & Lee, 1997). We adapted the ideas of Java et al. (2007) about user intention on Twitter to measure actual use of Twitter/Facebook. As no existing research has empirically tested networking quality and net benefits, we followed the measure development process suggested by Straub, Boudreau, and Gefen (2004) and Lewis, Templeton, and Byrd (2005), as explained below.

First the literature on SNAs provided us with the basis to develop the potential measures of networking quality, use of SNAs and net benefits. For example, Richter and Koch (2008) provide a conceptual discussion on SNA functions. Java et al. (2007) have measured user intention to use Twitter. Following these preliminary works documented in the literature, we conducted panel interviews with a total of 20 SNA users to obtain their qualitative feedback on the potential measures. In the

interview context, either Facebook or Twitter was chosen as the focus of this research because of both their success and their leading roles as SNAs. We then matched interviewees' qualitative feedback with the identification of SNA functions provided by the literature to develop the measures of networking quality, use of SNAs and net benefits. Integrating with the panel discussions and the literature, we finally specified six aspects - identity management, expert search, content management, context awareness, network awareness, and information exchange - to measure networking quality. For the dependent variable, net benefit, the integration of the panel discussion and the literature projects four measures covering the expansion of social network, obtaining desired knowledge and information, sharing information effectively and efficiently, and improvement in the quality of social life.

In addition to the panel discussion, we also calculated content validity ratios (CVR) and conducted card sorting exercises, following the suggestions from Straub, Boudreau, and Gefen (2004) and Lewis, Templeton, and Byrd (2005), to ensure the content validity of those newly developed measures. We recruited 40 SNA users to voluntarily evaluate the representativeness of the measures for the focal construct online. Those SNA users were asked to score all items derived from the literature review and the previous panel discussions, using the following scale "1=not relevant, 2=important, and 3=essential" (Lewis, Templeton, & Byrd, 2005). Following the less stringent criterion (including both important and essential items when calculating the positive indicators) recommended by Lewis, Templeton, and Byrd (2005), the CVRs calculated are all above the satisfactory level of 0.29 based on the responses from these 40 SNA users. Items evaluated and the corresponding CVRs are summarized in Appendix 1.

To further explore the reliability and validity of the measurement items, we conducted two rounds of card sorting exercises, following the steps documented by Moore and Benbasat (1991). In a pool of cards, 34 survey items were initially created for the study's 7 principal constructs. A panel of three judges (all of whom are SNA users) - an academic, a PhD student, and a working adult not related to academia - was formed. In the first round of the card sorting exercise, the judges were not provided with the construct names, and they were asked to label each item. In this round, the correct hit ratio was 87.3%. Based on these results and the judges' qualitative feedback, we revised ambiguous or poorly worded items. Second, a structured card sorting was conducted. The names of the 7 constructs were provided to another 3-judge panel (with the same characteristics as the first panel) and a 96.1% correct hit ratio was achieved, indicating that most measurement items were placed under their theorized measures. Since 96.1% is a satisfactory level of reliability (Moore & Benbasat, 1991), we did not conduct a third-round of card sorting. Nevertheless, we further modified the wording of the ambiguous items and then put them into the following pilot test.

In the pilot test, we sent the online survey to the members of the Association for Information Systems in mid-2011. Respondents to this pilot survey were asked to indicate their experience and evaluation of Twitter. Thirty valid responses were received in one week. We emailed most of the respondents in order to obtain their qualitative feedback on the measures and the survey. We revised ambiguous questions based on the respondents' suggestions. Appendix 1 documents all measures used in the later formal survey.

One of the authors and also one research assistant were responsible for recruiting survey respondents from Twitter.com and Facebook.com on a voluntary and random basis. They followed the Tweets,

published Tweets and sent out invitations to participate in online surveys to Twitter. A similar method was used to recruit survey respondents from Facebook. We used the "News Feed" function at Facebook to locate Facebook users and then posted the survey invitation to the users. Over two months, we contacted 556 Twitter and 780 Facebook users, and collected 149 and 168 valid responses on Twitter and Facebook respectively. The overall response rate was 23.7%. Table 2 shows the demographic data.

Table 2. Demographic Data (Facebook Users: 168; Twitter Users: 149; Full Sample = 317)

Items	Options	Percentage		Items	Options	Percentage	
		Facebook	Twitter			Facebook	Twitter
Gender	Male	49.70%	40.70%	Frequency of Visit	Everyday	55.03%	73.33%
	Female	50.30%	59.30%		Once a week	23.08%	13.33%
					2 or 3 times a month	10.65%	4.00%
					Once a month	5.92%	2.00%
					2 or 3 times a week	5.33%	7.33%
Age	15 or below	0.59%	14.00%	The Frequency of Updating Facebook Contents/ Publishing a Tweet	Everyday	9.47%	61.33%
	16-26	31.95%	43.33%		2 or 3 times a week	18.93%	16.67%
	27-36	36.69%	22.00%		Once a week	13.02%	6.00%
	37-46	13.02%	14.67%		2 or 3 times a month	17.75%	4.00%
	47-56	12.43%	4.67%		Once a month	28.99%	3.33%
	57 or above	5.33%	1.33%		Never, I read others' tweets /Facebook updates only	11.83%	8.67%
Education	Junior High School or below	1.78%	14.00%	Frequency of Receiving an Update from friends at Facebook/ Receiving a Tweet	Everyday	21.89%	59.33%
	Senior High School or Technical School	1.18%	23.33%		2 or 3 times a week	27.81%	14.00%
	Junior College	2.37%	8.67%		Once a week	17.75%	6.67%
	Bachelor's Degree	19.53%	23.33%		2 or 3 times a month	18.93%	7.33%
	Master's Degree or above	75.15%	30.67%		Once a month	13.61%	4.67%
					More than once month	0.00%	8.00%
Length of Usage	Just start	1.18%	12.00%	No. of Friends in Facebook/ Followers in Twitter	0-100	36.09%	60.00%
	Within 6 months	3.55%	34.67%		101-200	23.67%	15.33%
	About 1 year	14.20%	36.00%		201-300	15.38%	6.00%
	About 2 year	39.64%	12.67%		301-400	12.43%	4.00%
	About 3 year	41.42%	4.67%		Above 400	12.43%	14.67%
Average Time Spent on Facebook/Twitter per Day	6 hours or above	1.18%	14.00%	No. of Followers in Twitter	0-100	Not applicable	57.53%
	4-5 hours	2.37%	18.00%		101-200		16.44%
	2-3 hours	8.88%	23.33%		201-300		6.85%
	Nearly 1 hour	11.24%	20.67%		301-400		6.16%
	Less than 1 hour	76.33%	24.00%		Above 500		13.02%

5. Data Analysis

5.1 Validating the Measures

We used the Statistical Package for the Social Sciences (SPSS) and Smart Partial Least Squares (SPLS) for verifying the measurements, as well as testing the whole model. Convergent and discriminant validity are confirmed by factor analysis (as shown in Appendix 2). Cronbach's alphas of all constructs are above 0.80 (Table 3). The square roots of the Average Variance Extracted (AVE) of all constructs are above 0.75 (diagonal elements of Table 4), ensuring that the AVE for each construct is greater than the squared correlations between constructs.

Table 3. Results of Validity and Reliability Analyses

	Full sample (N = 317)			Facebook (N = 168)			Twitter (N = 149)		
Constructs	Cronbach Alpha	Composite Reliability	AVE	Cronbach Alpha	Composite Reliability	AVE	Cronbach Alpha	Composite Reliability	AVE
Networking Quality	0.84	0.88	0.55	0.90	0.93	0.68	0.88	0.91	0.62
System Quality	0.82	0.88	0.65	0.80	0.87	0.63	0.82	0.88	0.65
Information Quality	0.86	0.90	0.70	0.87	0.91	0.72	0.87	0.91	0.72
Service Quality	0.97	0.98	0.93	0.99	0.99	0.96	0.98	0.99	0.95
User Satisfaction	0.93	0.95	0.87	0.96	0.97	0.92	0.95	0.97	0.90
Use	0.83	0.89	0.67	0.88	0.92	0.74	0.87	0.92	0.73
Net Benefit	0.85	0.90	0.69	0.90	0.93	0.77	0.88	0.92	0.74

Table 4. Mean, Standard Deviation, Correlations and the Square Root of AVE

Constructs	Facebook (N = 168)	Twitter (N = 149)	Full sample (N = 317)	Full sample (N = 319)						
	Mean(S.D.)	Mean(S.D.)	Mean(S.D.)	1	2	3	4	5	6	7
1. Networking Quality	4.81 (1.07)	5.45 (1.28)	5.07 (1.24)	0.79						
2. System Quality	5.10 (1.12)	5.54 (1.43)	5.34 (1.16)	0.55	0.80					
3. Information Quality	4.42(1.27)	5.17 (1.31)	4.77(1.34)	0.73	0.63	0.85				
4. Service Quality	1.65 (1.56)	2.23 (2.27)	1.92 (1.94)	0.16	0.09	0.20	0.97			
5. User Satisfaction	5.08 (1.19)	5.35 (1.52)	5.29 (1.32)	0.74	0.66	0.70	0.10	0.95		
6. Use	3.76 (1.53)	5.17 (1.54)	4.42 (1.69)	0.67	0.37	0.62	0.24	0.62	0.95	
7. Net Benefit	4.55 (1.36)	5.35 (1.52)	4.92 (1.48)	0.74	0.47	0.69	0.18	0.72	0.76	0.86

Note: Diagonal elements display the square root of AVE

We also conducted tests for common method bias (i.e., variance attributed to measurement method rather than variance explained by the study's constructs). First, evidence for common method bias exists if one principal factor counts for most of the variance explained (Podsakoff & Organ, 1986). Our principal components factor analysis for full samples indicates that the seven constructs with eigenvalues greater than 1.0 account for 78.57% of the variance, while the first construct explained 19.24% of the variance. Table 4 shows that the highest inter-construct correlation is 0.74, while common method bias is usually evidenced by extremely high correlations (r >.90) (Bagozzi, Yi, & Phillips, 1991). These tests suggest that common method bias is not a serious problem in this study. The value of the Kaiser-Meyer-Olkin test for the full sample (n=319) is 0.94, suggesting the sample adequacy of this study (Li & Rao, 2010). Collinearity indicators (tolerance values and variance inflation factors) were also calculated and found to be less than the acceptable cut-off points (Amoroso & Cheney, 1991; Halawi, McCarthy, & Aronson, 2008), indicating that the study does not suffer from multicollinearity problems.

5.2 Testing the Research Model

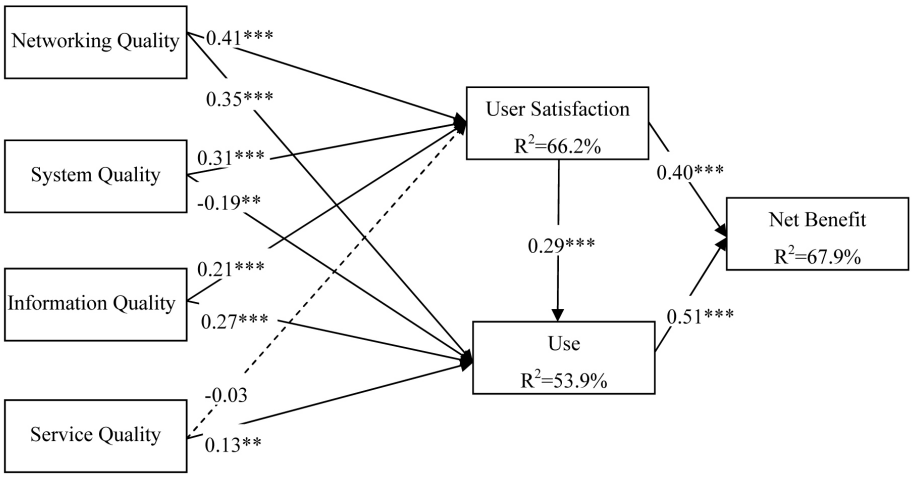

Fig. 3. SPLS Results of Structural Model
(n=317 SNA Users; *0.05<p<0.10; **0.01<p<0.05;***p<0.01)

We ran the research models using SPLS with the full sample (n=317). The confirmatory factor loading shown in the SPLS analysis is satisfactory where item loadings all exceed 0.70 and are higher than the cross loadings. The SPLS results analyzing the structural model are summarized in Figure 3. The proposed research model received strong support from the data, except for H2b and H4a. The results show that networking quality has a significant impact on user satisfaction (b=0.41, p<0.01) and use (b=0.35, p<0.01), thus supporting H1a and H1b. System quality also has a significantly positive influence on user satisfaction (b=0.31, p<0.01), thus validating H2a. However, we found a significantly negative relationship between system quality and use (b=-0.19, 0.05<p<0.10), thus rejecting H2b. The influences of information quality on both user satisfaction

(b=0.21, p<0.01) and use (b=0.27, p<0.01) are both significant, supporting H3a and H3b. The relationship between service quality and use (b=0.13, 0.05<p<0.10) was found to be significantly positive, thus validating H4b. The results show that user satisfaction has significant effects on both use (b=0. 29, p<0.01) and net benefits (b=0.40, p<0.01), validating H5 and H6. Together with the contribution from use (H7: b=0.51, p<0.01) to net benefit, the explained variance of net benefits yields 67.9%. The variances explained by user satisfaction and use are 66.2% and 53.9%, respectively. In sum, the R2 scores for all dependent variables, together with the AVE, Cronbach alpha, composite reliability and the high factor loadings, yield an adequate goodness-of-fit for the overall research model (Chin, 1998; Leung et al., 2012).

5.3 Robustness Testing

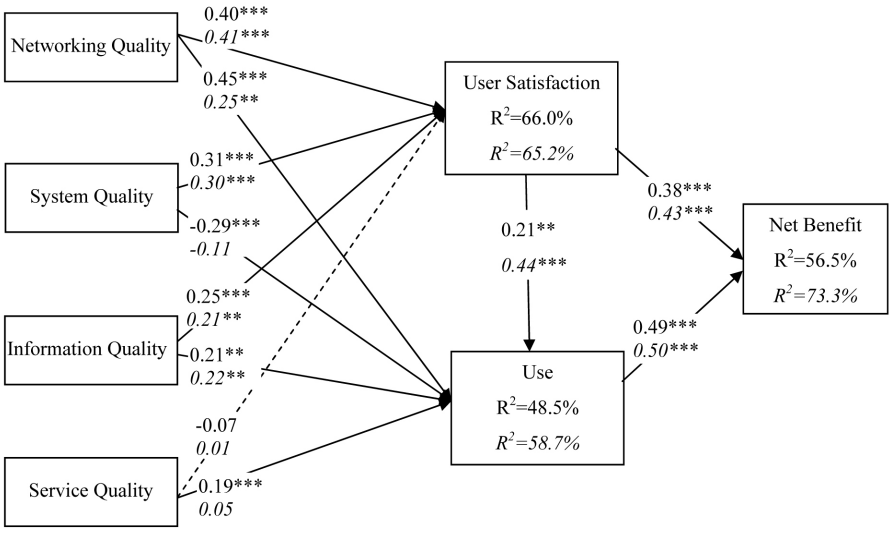

Fig. 4. SPLS Results of Structural Model
(n1=168 Facebook Users; n2=149 Twitter Users)
(Note: Path coefficients for Facebook users are shown first and followed by Twitter users in italics; *0.05<p<0.10; **0.01<p<0.05;***p<0.01)

The data indicate the significant negative impacts of system quality on use and the insignificant influence of service quality on user satisfaction. In order to investigate whether these finding are applicable to both Twitter and Facebook users, we conducted separate SPLS analysis with these two sets of samples (Figure 4). Most of the paths are consistent across both Facebook and Twitter users. However, subtle differences are identified between these two sets of samples. Specifically, the path from system quality to use is found to be negatively significant for Facebook users (b=-0.29, p<0.01), but insignificant for Twitter users (b= -0.11, p>0.10). A significant positive impact of service quality on use is found for Facebook users (b=0.19, p<0.01), but not Twitter users (b=0.05, p>0.10). We discuss these findings in the following section.

6. Discussion, Implications and Future Research

This research has several key findings. First, we have identified the contribution of the new construct, networking quality, on use and user satisfaction. Its effect is the strongest among all the independent variables determining user satisfaction. Second, information quality also plays an important role in predicting user satisfaction and use, while service quality only has moderate impacts on user satisfaction. Third, this study suggests consistent conclusions are yet to be drawn across Facebook and Twitter users on the impacts of system quality on use. System quality is found to be negatively associated with use of Facebook, but not Twitter. We speculate, on the one hand, that this is due to people's addiction to Facebook. In the past few years, many security and privacy incidents have occurred in Facebook, suggesting serious system problems. However, people continue using it even though they may complain or have negative feelings on system quality. Such "irrational" behavior can be explained because Facebook contains the contact details of users' friends. People continue using it even though they have negative perceptions of the system quality, since they need to maintain contact and communication with their friends. This finding, on the other hand, implies the consistent and conclusive role of networking quality in predicting actual use of SNAs crossing two sets of samples. Fourth, our data indicates that over 70% of respondents answered "not applicable" to the questions related to service quality, suggesting the focal SNA's customer service is not utilized by most SNA users. For a self-administrated and self-operated SNA, service quality appears not to be a critical issue for evaluating SNA success, especially where user satisfaction is concerned. This finding highlights the difference between traditional ISSMs and the SNA success model. Last, but not least, the data suggests that the relationships among user satisfaction, use and net benefit are very positive. Both use and user satisfaction generate significant levels of net benefit in using the focal SNA. Members of Twitter find that the SNA can enable them to keep in touch with others and exchange information. Net benefits are thus generated.

Theoretically, the dimension of networking quality has extended DeLone and McLean's (1992, 2003) ISSMs by emphasizing the unique and underlying characteristics of SNAs. This study is among the first attempts to conceptualize the underlying characteristics and purpose of designing SNAs, viz., quality networking functionalities. Networking quality concerns the social networking provisions with socialization and swift information exchange, helping SNA members to keep in touch with each other. Specifically, this new construct formalizes the roles of contact organization, information sharing on what others are doing and going to do, finding people or experts with similar interests, as well as connecting people through short messages in SNAs. These networking characteristics are conceptually distinct from information, system and service quality characteristics discussed in ISSMs. Meanwhile, fitting with the purpose of SNAs, the ultimate outcome of using SNAs, viz., the construct of net benefits, vividly captures the expansion of social networks and quality of social life. These net benefits of using SNAs are conceptually distinct from the benefits of using general IS or technologies (such as KMS, DSS, or ERP systems) in organizations. Therefore we consider that the conceptualization of these two constructs contributes to and extends the literature on ISSMs. Future research on SNAs should include networking quality and the net benefits achieved through use of SNAs.

Empirically speaking, this study has responded directly to the call from Petter, DeLone, and McLean (2008) to examine ISSMs in the area of social networking. In our empirical study, networking quality turns out to have the strongest link with user satisfaction and actual use among all independent variables. The results show that Twitter and Facebook provide a quality social networking platform. Individual members can distribute Tweets through instant messengers, mobile phones, email or the Web, while Twitter's search engine keeps users updated with hot news. These functions contribute to the quality of Twitter. Similarly, Facebook users are able to keep in touch with friends and exchange information effectively. That is the main reason why Twitter and Facebook are so successful. In addition, the significant negative effect of system quality on actual use is worth noticing, especially in the case of Facebook. The data suggests that user behavior is not consistent with their evaluation of system quality, which is the reverse of the original ISSMs. It does not mean that system quality fails to predict the actual use of SNA, but instead implies the overwhelming effects of networking quality on actual use behavior over the security and privacy issues of SNAs, such as Facebook. Therefore when developing a social networking website, the first priority must be to ensure the networking quality. On the other hand, this study demonstrates the need for further empirical examination of the predictive role of system quality on actual IT use, consistent with the non-inclusive predictive role of system quality on use as identified in the literature (19 out of 34 studies found no empirical support for the link between system quality and use; see Appendices A and B).

For future research, we call for further verification of the generalizability of the proposed research model. Although Facebook and Twitter are typical SNAs, this study should be replicated with other SNAs such as Xanga and Second Life, and also cover a broader range of users in terms of demography. Although this study only showed that networking quality is a contributing factor of Twitter's success, our study has not shown specifically which elements of networking quality contribute more to an SNA's success. Future studies investigating the effects of SNAs can further verify the effectiveness of each element included in the networking quality and net benefits. Potentially, networking quality and net benefits can be developed into a multidimensional second-order constructs in the future. Qualitative data can be included as the input to the development of the measures, which can enrich and strengthen the rigor of the scale development process. Another research direction is related to SNA applications in business as to whether internal usage can improve social connections among employees and external utilization can improve marketing and customer service.

7. Conclusion

Practically, the recent surge of popularity for SNAs has aroused substantial public interest: users can update their status anywhere as well as send and receive information globally. SNAs no longer constitute a simple platform for people to form social networks, but also serve as effective tools for various business purposes. This is likely to enhance SNAs' prevalence in the future. We have witnessed the importance of effective social networking in determining an SNA's success. It is always critical to provide easy ways for SNA users to get to know and keep in touch with other persons with similar interests. With this underlying principle in mind, the design of SNAs will always

needs to be fine-tuned to accommodate the users' need for quality networking functions. We look forward to more theoretical and practical studies on SNAs.

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[Appendix 1] Measurement Items

Networking Quality

Scale: Strongly disagree (1) - Strongly agree (7)

(1) Twitter makes it easy for me to create new short message. (CRV: 0.90; Dropped by Factor Analysis)
(2) Twitter makes it easy for me to present myself. (CRV: 0.95; Dropped by Factor Analysis)
(3) Twitter makes it easy for me to organize my contacts. (CRV: 0.95)
(4) Twitter makes it easy for me to get to know people. (CRV: 0.90)
(5) Twitter makes it easy for me to have expert/person search. (CRV: 0.90)
(6) Twitter makes it easy for me to keep in touch with what others doing and going to do. (CRV: 0.95)
(7) Twitter makes it easy for me to share information. (CRV: 0.90)
(8) Twitter makes it easy for me to find people with similar interest. (CRV: 0.85)

System Quality

Scale: Strongly disagree (1) - Strongly agree (7)

(1) Twitter is easy to use.
(2) Twitter is user friendly.
(3) Twitter is stable.
(4) The response time of Twitter is acceptable.

Information Quality

Scale: Strongly disagree (1) - Strongly agree (7)

(1) The content representation provided by Twitter user is logical.
(2) The information provided by Twitter users is important and helpful for my work and social life.
(3) The information provided by Twitter users is updated, meaningful, and practicable.
(4) The classification or index in Twitter users is clear and unambiguous.

Service Quality

If you never contact the Twitter administrators/customer service by any means (e.g., email, phone), please select "NA". Scale: Not Applicable (NA), Strongly disagree (1) - Strongly agree (7)

(1) Twitter administrator/customer service provides their services at the time they promise to do so.
(2) Twitter administrator/customer service is always willing to help you.
(3) Twitter administrator/customer service has knowledge to answer your questions.
(4) Twitter administrator/customer service understands your specific needs.

User Satisfaction

Scale: Strongly disagree (1) - Strongly agree (7)

(1) I am satisfied that Twitter meets my social networking needs. (Dropped by Factor Analysis)
(2) I am satisfied with Twitter's efficiency.

(3) I am satisfied with Twitter's effectiveness.
(4) Overall, I am satisfied with Twitter.

Use

Scale: Strongly disagree (1) - Strongly agree (7)
(1) I use Twitter to keep in touch with friends. (Dropped by Factor Analysis)
(2) I use Twitter to help me record my work in a day. (Dropped by Factor Analysis)
(3) I use Twitter to communicate knowledge and information with friends.
(4) I use Twitter to share my general knowledge.
(5) I use Twitter to share my specific knowledge.
(6) I use Twitter to make new friends.

Net benefit

Scale: Strongly disagree (1) - Strongly agree (7)
(1) Twitter expands my social network. (CRV: 0.95)
(2) Twitter helps me acquire desired knowledge and information. (CRV: 0.85)
(3) With Twitter, I can share information with less time and less effort. (CRV: 0.95)
(4) Twitter improves the quality of my social life. (CRV: 0.90)

[Appendix 2] The Results of Principal Component Analysis

Components	1	2	3	4	5	6	7
Networking Quality 3	0.61	0.52	**0.80**	0.13	0.45	0.46	0.58
Networking Quality 4	0.60	0.66	**0.83**	0.19	0.38	0.58	0.62
Networking Quality 5	0.57	0.56	**0.75**	0.22	0.37	0.61	0.51
Networking Quality 6	0.52	0.58	**0.79**	-0.02	0.47	0.43	0.60
Networking Quality 7	0.56	0.60	**0.76**	0.04	0.53	0.49	0.64
Networking Quality 8	0.60	0.56	**0.80**	0.19	0.39	0.59	0.54
System Quality 1	0.52	0.43	0.47	0.11	**0.84**	0.35	0.54
System Quality 2	0.55	0.45	0.49	0.07	**0.87**	0.37	0.58
System Quality 3	0.50	0.30	0.40	0.11	**0.77**	0.24	0.47
System Quality 4	0.47	0.30	0.39	0.00	**0.73**	0.19	0.52
Information Quality 1	**0.82**	0.52	0.59	0.17	0.62	0.46	0.58
Information Quality 2	**0.83**	0.64	0.61	0.13	0.44	0.56	0.59
Information Quality 3	**0.91**	0.64	0.67	0.15	0.53	0.59	0.63
Information Quality 4	**0.84**	0.54	0.63	0.22	0.58	0.49	0.56
Service Quality 1	0.19	0.15	0.16	**0.95**	0.07	0.22	0.10
Service Quality 2	0.20	0.19	0.16	**0.98**	0.09	0.24	0.10
Service Quality 3	0.18	0.19	0.15	**0.97**	0.10	0.23	0.11
Service Quality 4	0.20	0.17	0.16	**0.99**	0.08	0.23	0.10
User Satisfaction 2	0.63	0.64	0.67	0.12	0.64	0.56	**0.94**
User Satisfaction 3	0.68	0.69	0.73	0.10	0.62	0.59	**0.95**
User Satisfaction 4	0.67	0.72	0.71	0.08	0.63	0.61	**0.95**
Use 3	0.55	0.68	0.56	0.13	0.37	**0.82**	0.61
Use 4	0.53	0.63	0.55	0.25	0.29	**0.92**	0.52
Use 5	0.51	0.61	0.52	0.23	0.27	**0.90**	0.46
Use 6	0.53	0.66	0.65	0.21	0.30	**0.77**	0.51
Net Benefit 1	0.58	**0.84**	0.65	0.13	0.43	0.61	0.63
Net Benefit 2	0.64	**0.87**	0.63	0.18	0.37	0.71	0.57
Net Benefit 3	0.55	**0.86**	0.59	0.13	0.42	0.62	0.61
Net Benefit 4	0.60	**0.87**	0.67	0.18	0.39	0.67	0.65
Eigenvalue	**5.58**	**3.92**	**3.37**	**3.12**	**2.48**	**2.28**	**2.05**
Variance Explained Total=78.57%	**19.24**	**13.51**	**11.60**	**10.75**	**8.56**	**7.85**	**7.06**

[Appendix A] Empirical Studies on IS Success Models on the Individual Level

Relationship Shown in IS Success Models	Results from (Petter & Fruhling, 2011)	Empirical Studies from 2008-2012	Research Context	Study Results	Overall Conclusion based on Studies from 1992- June 2012
System quality → use	9 of 21 positive	(Sambasivan, Patrick, & Che, 2010)	G2B system such as electronic procurement system (EPS) by	+ (intention to use)	**18 of 34 positive**
		(Kim et al., 2009)	Ubiquitous computing applications such as RFID, U-banking service and mobile-based SCM service	Mixed (+ 1 of 3)	
		(Leung et al., 2012)	Open source software usage	+	
		(Wang & Liao, 2008)	E-government	NS	
		(Khayun, Ractham, & Firpo, 2012)	E-excise/E-government	+	
		(Freeze et al., 2010)	E-learning system	+	
		(Khodakarami & Chan, 2011)	CRM system	+	
		(Nyagowa et al., 2011)	E-school system	+	
		(Murnan, 2006)	DMB (Digital Multimedia Broadcasting) technology	NS (Intention to use)	
		(Leung et al., 2012)	KMS	+	
		(Adeyinka & Mutula, 2010)	E-learning system	+	
System quality → user satisfaction	21 of 21 positive	(Landrum, Prybutok, & Zhang, 2010)	Digital information service delivered in army libraries	+	**44 of 46 positive**
		(Floropoulos et al., 2010)	Greek taxation information system	NS	
		(Lee & Chung, 2009)	Mobile banking in Korea	+	
		(Zhou, Lu, & Wang, 2009)	Online shopping	+ (website design quality on satisfaction)	
		(Ozkan & Koseler, 2009)	A web-based learning system	+ (correlation)	
		(Jin et al., 2009)	A computer-supported social network	+	
		(Lee, Choi, and Kang, 2009)	Online shopping	+ (system satisfaction to e-satisfaction)	
		(Lee, Kim, & Gupta, 2009)	Open source software usage	+	
		(Wang & Liao, 2008)	E-government	+	
		(McGill & Klobas, 2008)	End user developed application such as Spreadsheet	+ (2)	

Relationship Shown in IS Success Models	Results from (Petter & Fruhling, 2011)	Empirical Studies from 2008-2012	Research Context	Study Results	Overall Conclusion based on Studies from 1992- June 2012
		(Cheung & Lee, 2007)	A web-based student information system	+	
		(Kim & Kim, 2008)	Application service provider	+	
		(Lin, 2008)	Virtual community	+	
		(Khayun, Ractham, & Firpo, 2012)	E-excise/E-government	NS	
		(Freeze et al., 2010)	E-learning system	+	
		(Khodakarami & Chan, 2011)	CRM system	+	
		(Nyagowa et al., 2011)	E-school system	+	
		(Mun et al., 2010)	DMB (Digital Multimedia Broadcasting) technology	+	
		(Fang, Chiu, & Wang, 2011)	Repurchase intention of online shopping	+	
		(Lewis, Templeton, & Byrd, 2005)	KMS	+	
		(Adeyinka & Mutula, 2010)	E-learning system	+	
		(Hsu, Lai, & Weng, 2008)	E-learning system	+ (technical and educational)	
		(Aggelidis & Chatzoglou, 2012)	Hospital information system	+	
		(Wang, 2008)	E-learning system	+	
System quality → net benefits	15 of 22 positive	(Wang, Solan, & Ghods, 2010)	Distance learning	+ (system flexibility on impacts)	**20 of 34 positive**
		(Hwang & Xu, 2008)	Data warehouse usage	NS (on individual benefits)	
		(Marloes et al., 2008)	Vendor managed inventory (VMI)	+ (on VMI success)	
		(McGill & Klobas, 2008)	End user developed application such as Spreadsheet	+ (2 on individual impact)	
		(Bernroider, 2008)	ERP	NS (6)	
		(Prybutok, Zhang, & Ryan, 2008)	E-government	+	
Information quality → use	3 of 6 positive	(Sambasivan, Patrick, & Che, 2010)	G2B system like electronic procurement system	Mixed (1 of 3 positive on Intention to use)	**13 of 21 positive**
		(Yoon & Kim, 2009)	Online shopping	+ (intention to repurchase)	
		(Kim et al., 2009)	Ubiquitous computing applications such as RFID, U-banking service and mobile-based SCM service	Mixed (2 of 3 positive)	

Relationship Shown in IS Success Models	Results from (Petter & Fruhling, 2011)	Empirical Studies from 2008-2012	Research Context	Study Results	Overall Conclusion based on Studies from 1992- June 2012
		(Wang & Liao, 2008)	E-government	+	
		(Saeed & Abdinnour-Helm, 2008)	A web-based student information system	+	
		(Khayun, Ractham, & Firpo, 2012)	E-excise/E-government	NS	
		(Freeze et al., 2010)	E-learning system	+	
		(Nyagowa et al., 2011)	E-school system	+	
		(Murnan, 2006)	DMB (Digital Multimedia Broadcasting) technology	+	
		(Leung et al., 2012)	KMS	NS	
		(Adeyinka & Mutula, 2010)	E-learning system	+	
Information quality → user satisfaction	15 of 16 positive	(Landrum, Prybutok, & Zhang, 2010)	Digital information service delivered in army libraries	+	**33 of 35 positive**
		(Floropoulos et al., 2010)	Greek Taxation Information System	+	
		(Lee & Chung, 2009)	Mobile banking in Korea	+	
		(Ozkan & Koseler, 2009)	A web-based learning system	+ (correlation)	
		(Lee, Kim, & Gupta, 2009)	Online shopping	+ (information satisfaction to E-satisfaction)	
		(Wang & Liao, 2008)	E-government	+	
		(Cheung & Lee, 2007)	A web-based student information system	+	
		(Lin, 2008)	Virtual community	+	
		(Khayun, Ractham, & Firpo, 2012)	E-excise/E-government	+	
		(Ganley & Lampe, 2009)	E-learning system	+	
		(Khodakarami & Chan, 2011)	CRM system	+	
		(Nyagowa et al., 2011)	E-school system	+	
		(Mun et al., 2010)	DMB (Digital Multimedia Broadcasting) technology	+	
		(Fang, Chiu, & Wang, 2011)	Repurchase intention of online shopping	+	
		(Leung et al., 2012)	KMS	+	
		(Adeyinka & Mutula, 2010)	E-learning system	+	

Relationship Shown in IS Success Models	Results from (Petter & Fruhling, 2011)	Empirical Studies from 2008-2012	Research Context	Study Results	Overall Conclusion based on Studies from 1992- June 2012
		(Hassanzadeh, Kanaani, & Elahi, 2012)	E-learning system	+	
		(Aggelidis & Chatzoglou, 2012)	Hospital information system	+	
		(Wang & Chiu, 2011)	E-learning system	NS	
Information quality → net benefits	9 of 11 positive	(Seddon, Calvert, & Yang, 2010)	Enterprise systems (such as ERP)	+	**16 of 22 positive**
		(Yoon, 2009)	ERP	+ (on work efficiency)	
		(Hwang & Xu, 2008)	Data warehouse usage	+ (on individual benefits)	
		(Marloes et al., 2008)	Vendor managed inventory (VMI)	NS (on VMI success)	
		(Bernroider, 2008)	ERP	Mix (3 out of 6)	
		(Prybutok, Zhang, & Ryan, 2008)	E-government	+	
Service quality → use	0 of 3 positive	(Sambasivan, Patrick, & Che, 2010)	G2B system like electronic procurement system	+ (intention to use)	**7 of 13 positive**
		(Yoon & Kim, 2009)	Online shopping	+ (intention to repurchase)	
		(Kim et al., 2009)	Ubiquitous computing applications such as RFID, U-banking service and mobile-based SCM service	Mixed (1 of 3 positive)	
		(Lee, Kim, & Gupta, 2009)	Open source software usage	NS (community service quality)	
		(Wang & Liao, 2008)	E-government	+	
		(Khayun, Ractham, & Firpo, 2012)	E-excise/E-government	+	
		(Adeyinka & Mutula, 2010)	E-learning system	+	
		(Hassanzadeh, Kanaani, & Elahi, 2012)	E-learning system	+ (intention to use)	
Service quality → user satisfaction	6 of 12 positive	(Landrum, Prybutok, & Zhang, 2010)	Digital information service delivered in army libraries	+	**19 of 25 positive**
		(Floropoulos et al., 2010)	Greek taxation information system	+	
		(Zhou, Lu, & Wang, 2009)	Online shopping	+	
		(Ozkan & Koseler, 2009)	A web-based learning system	+ (correlation)	
		(Lee, Choi, and Kang, 2009)	Online shopping	+	
		(Lee, Kim, & Gupta, 2009)	Open source software usage	+ (community service quality)	

Relationship Shown in IS Success Models	Results from (Petter & Fruhling, 2011)	Empirical Studies from 2008-2012	Research Context	Study Results	Overall Conclusion based on Studies from 1992- June 2012
		(Wang & Liao, 2008)	E-government	+	
		(Kim & Kim, 2008)	Application service provider	+	
		(Cenfetelli, Benbasat, & Al-Natour, 2008)	B2C website usage	+	
		(Khayun, Ractham, & Firpo, 2012)	E-excise/E-government	+	
		(Nyagowa et al., 2011)	E-school system	+	
		(Fang, Chiu, & Wang, 2011)	Repurchase intention of online shopping	+	
		(Adeyinka & Mutula, 2010)	E-learning system	+	
		(Wang & Chiu, 2011)	E-learning system	+	
Service quality → net benefits	4 of 7 positive	(Bernroider, 2008)	ERP	Mix (2 out of 6)	**7 of 14 positive**
		(Prybutok, Zhang, & Ryan, 2008)	E-government	+	
Use → user satisfaction	4 of 5 positive	(Kim et al., 2009)	Ubiquitous computing applications such as RFID, U-banking service and mobile-based SCM service	+	**10 of 12 positive**
		(Rouibah, Hamdy, & Al-Enezi, 2009)	Enterprise information systems	+	
		(Wang & Liao, 2008)	E-government	+	
		(Khayun, Ractham, & Firpo, 2012)	E-excise/E-government	+	
		(Nyagowa et al., 2011)	E-school system	+	
		(Leung et al., 2012)	KMS	NS	
		(Adeyinka & Mutula, 2010)	E-learning system	+	
Use → net benefits	16 of 22 positive	(Kim et al., 2009)	Ubiquitous computing applications such as RFID, U-banking service and mobile-based SCM service	+	**27 of 34 positive**
		(McGill & Klobas, 2008)	End user developed application such as Spreadsheet	+ (utilization on perceived impacts on learning)	
		(Chung et al., 2008)	ERP usage	+	
		(Lee, Kim, & Gupta, 2009)	Open source software usage	+ (on individual net benefits)	
		(Wang & Liao, 2008)	E-government	+	
		(Khayun, Ractham, & Firpo, 2012)	E-excise/E-government	NS	
		(Freeze et al., 2010)	E-learning system	+	
		(Khodakarami & Chan, 2011)	CRM system	+ (individual impacts)	
		(Nyagowa et al., 2011)	E-school system	+	

Relationship Shown in IS Success Models	Results from (Petter & Fruhling, 2011)	Empirical Studies from 2008-2012	Research Context	Study Results	Overall Conclusion based on Studies from 1992- June 2012
		(Leung et al., 2012)	KMS	+	
		(Chen, 2012)	Electronic brokerage systems	+	
		(Adeyinka & Mutula, 2010)	E-learning system	+	
User satisfaction → use	17 of 21 positive	(Zhou, Lu, & Wang, 2009)	Online shopping	+ (satisfaction on Repurchase intention)	**32 of 37 positive**
		(Jin et al., 2009)	A computer-supported social network	+ (satisfaction on continuance intention)	
		(Lai & Yang, 2009)	Enterprise applications in e-business	+ (satisfaction on intention to use)	
		(Lee, Choi, and Kang, 2009)	Online shopping	+ (satisfaction to repurchase intention)	
		(Lee, Kim, & Gupta, 2009)	Open source software usage	+	
		(Lin, 2008)	Virtual community	+ (satisfaction to loyalty)	
		(Cenfetelli, Benbasat, & Al-Natour, 2008)	B2C website usage	+ (on continued website usage)	
		(Khayun, Ractham, & Firpo, 2012)	E-excise/E-government	+	
		(Nyagowa et al., 2011)	E-school system	+	
		(Mun et al., 2010)	DMB (Digital Multimedia Broadcasting) technology	+	
		(Fang, Chiu, & Wang, 2011)	Repurchase intention of online shopping	+ (repurchase intention)	
		(Leung et al., 2012)	KMS	NS	
		(Chen, 2012)	Electronic brokerage systems	+	
		(Adeyinka & Mutula, 2010)	E-learning system	+	
		(Hassanzadeh, Kanaani, & Elahi, 2012)	E-learning system	+	
		(Wang & Chiu, 2011)	E-learning system	+	
User satisfaction → net benefits	14 of 14 positive	(Richter & Koch, 2008)	Web usage	+ (satisfaction on perceived individual impact)	**30 of 30 positive**
		(Wang et al., 2008)	ERP usage	+ (satisfaction on innovate with IT)	
		(Lee, Kim, & Gupta, 2009)	Open source software usage	+ (on individual net benefits)	
		(Wang & Liao, 2008)	E-government	+	
		(McGill & Klobas, 2008)	End user application such as Spreadsheet	+ (2) (on individual impact)	

Relationship Shown in IS Success Models	Results from (Petter & Fruhling, 2011)	Empirical Studies from 2008-2012	Research Context	Study Results	Overall Conclusion based on Studies from 1992- June 2012
		(Hsu, Lai, & Weng, 2008)	ERP usage	+ (on both individual impacts and organizational impacts)	
		(Khayun, Ractham, & Firpo, 2012)	E-excise/E-government	+	
		(Freeze et al., 2010)	E-learning system	+	
		(Nyagowa et al., 2011)	E-school system	+	
		(Leung et al., 2012)	KMS	+	
		(Chen, 2012)	Electronic brokerage systems	+	
		(Adeyinka & Mutula, 2010)	E-learning system	+	
		(Hassanzadeh, Kanaani, & Elahi, 2012)	E-learning system	+ (3) (loyalty, benefits and goals achievement)	

[Appendix B] Empirical Studies on IS Success Models on the Organizational Level

Relationship Shown in IS Success Models	Results from (Petter & Fruhling, 2011)	Empirical Studies from 2008-2012	Research Context	Study Results	Overall Conclusion based on Studies from 1992- June 2012
System quality → use	2 of 6 positive	(Bock et al., 2009)	Knowledge-based systems	+	**5 of 9 positive**
		(Teo, Srivastava, & Jiang, 2008)	E-government	NS (intention to continue using)	
		(Khodakarami & Chan, 2011)	CRM system	+	
		(Petter & Fruhling, 2011)	Emergency response medical information system(ERMIS)	+	
System quality → user satisfaction	2 of 3 positive	(Lin, 2010)	ERP	+	**9 of 12 positive**
		(Bock et al., 2009)	Knowledge-based systems	NS	
		(Ku & Fan, 2009)	CRM system in travel industry	+	
		(Schaupp, Bélanger, & Fan, 2009)	e-commerce and online community	Mix (1 out of 2)	
		(Petter & Fruhling, 2011)	Enterprise information systems	+ (correlation)	
		(Teo, Srivastava, & Jiang, 2008)	E-government	+	
		(Khodakarami & Chan, 2011)	CRM system	+	
		(Petter & Fruhling, 2011)	Emergency response medical information system(ERMIS)	+	
System quality → net benefits	4 of 5 positive	(Ifinedo et al., 2010)	ERP	+ (Individual impact)	**6 of 9 positive**
		(Petter & Fruhling, 2011)	e-commerce and online community	Mix (1 out of 2)	
		(Gorla, Somers, & Wong, 2010)	Information system	NS (Organizational impacts)	
Information quality → use	1 of 1 positive	(Bock et al., 2009)	Knowledge-based systems	NS	**2 of 4 positive**
		(Teo, Srivastava, & Jiang, 2008)	E-government	+ (intention to continue using)	
		(Petter & Fruhling, 2011)	Emergency response medical information system (ERMIS)	NS	
Information quality → user satisfaction	3 of 3 positive	(Lin, 2010)	ERP	NS	**7 of 11 positive**
		(Bock et al., 2009)	Knowledge-based systems	+	
		(Petter & Fruhling, 2011)	E-commerce and online community	NS (2)	
		(Sambasivan, Patrick, & Che, 2010)	Enterprise information systems	+ (correlation)	
		(Teo, Srivastava, & Jiang, 2008)	E-government	NS	
		(Khodakarami & Chan, 2011)	CRM system	+	

Relationship Shown in IS Success Models	Results from (Petter & Fruhling, 2011)	Empirical Studies from 2008-2012	Research Context	Study Results	Overall Conclusion based on Studies from 1992- June 2012
		(Petter & Fruhling, 2011)	Emergency response medical information system (ERMIS)	+	
Information quality → net benefits	3 of 4 positive	(Ifinedo et al., 2010)	ERP	NS (Individual impact)	**6 of 8 positive**
		(Petter & Fruhling, 2011)	e-commerce and online community	+ (2; individual impacts)	
		(Gorla, Somers, & Wong, 2010)	Information system	+(Organizational impacts)	
Service quality → use	3 of 3 positive	(Bock et al., 2009)	Knowledge-based systems	+ (system update on use)	**4 of 6 positive**
		(Teo, Srivastava, & Jiang, 2008)	E-government	NS (intention to continue using)	
		(Petter & Fruhling, 2011)	Emergency response medical information system (ERMIS)	NS	
Service quality → user satisfaction	3 of 4 positive	(Bock et al., 2009)	Knowledge-based systems	NS (system update on user satisfaction)	**7 of 8 positive**
		(Petter & Fruhling, 2011)	Enterprise information systems	+ (correlation)	
		(Teo, Srivastava, & Jiang, 2008)	E-government	+	
		(Petter & Fruhling, 2011)	Emergency response medical information system(ERMIS)	+	
Service quality → net benefits	3 of 3 positive	(Ifinedo et al., 2010)	ERP	+ (Individual impact)	**5 of 5 positive**
		(Gorla, Somers, & Wong, 2010)	Information system	+(Organizational impacts)	
Use → user satisfaction	0 of 1 positive	No studies			**0 of 1 positive**
Use → net benefits	5 of 6 positive	(Khodakarami & Chan, 2011)	CRM system	+(Organizational impacts)	**7 of 8 positive**
		(Petter & Fruhling, 2011)	Emergency response medical information system (ERMIS)	+(Organizational impacts)	
User satisfaction → use	No studies	(Lin, 2010)	ERP	+	**3 of 3 positive**
		(Bock et al., 2009)	Knowledge-based systems	+	
		(Teo, Srivastava, & Jiang, 2008)	E-government	+(intention to continue using)	
User satisfaction → Net benefits	2 of 2 positive	(Cho, 2010)	Electronic documentation management system	+(Individual impact)	**5 of 5 positive**
		(Ku & Fan, 2009)	CRM system in travel industry	+ (on CRM profitability)	
		(Petter & Fruhling, 2011)	Emergency response medical information system (ERMIS)	+(Individual impacts)	
Net benefits → User satisfaction	0 of 3 positive	(Petter & Fruhling, 2011)	e-commerce and online community	+ (2; individual impacts)	**2 of 5 positive**