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UNDERSTANDING THE SUSTAINABILITY OF VIRTUAL COMMUNITIES IN CHINA

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Abstract

The sustainability of virtual communities is determined by the extent to which users are willing to continue using the supported virtual space. Building upon the information system continuance model and the information adoption model, a research model explaining user continuance intention to use virtual communities (e.g., Web-based Bulletin Board Systems) is proposed. The proposed model was tested using an online survey with the users of a non-profit-making Bulletin Board System established by a local university in mainland China. The results suggest that satisfaction and information usefulness are the two key factors influencing users' continuance intention to use virtual communities. Satisfaction in turn is determined by information usefulness and source credibility, while information usefulness is determined by both information quality and source credibility. Surprisingly, information quality does not have any significant direct impact on user satisfaction. The findings provide important implications for both researchers and practitioners.

1 INTRODUCTION

Virtual communities open up new possibilities for people to create and share knowledge among each other. "Computer-mediated space" and "member-generated and self-organized discussion" are the two basic characteristics of virtual communities (e.g., Hagel and Armstrong 1997; Wellman et al. 1999). "Computer-mediated space" (i.e., cyberspace) means that virtual communities can overcome time and space constraints and offer new opportunities for individuals to exchange knowledge (Wellman et al. 1999). "Member-generated and self-organized discussion" denotes that contents in virtual communities are created when members communicate, discuss, and share with each other (Hagel and Armstrong 1997).

Virtual communities can be established technically via computer-mediated communication (CMC) media in several ways, including Listservs, online chat rooms, multiuser domain, bulletin board systems (BBSes), newsgroups, instant messaging and Weblogs. In this study, we focus on virtual communities that are built on Web-based BBSes. With the development of the Internet, a new generation of BBS, Web-based BBS, has become one of the most common communication media, especially in China. A web-based BBS provides an asynchronous, interactive, text-based virtual environment to support discussing, learning, trading, playing games, meeting peers, and other social and functional activities (Pena-Shaff and Nicholls 2004). A Web-based BBS typically consists of many different sections grouped by different topics or interests. In each section, the messages are listed in reverse chronological order and each message posted by any member is visible to other members. A survey on BBS usage in China was conducted in 2005 and it found that the number of new BBSes doubles every year, leading Web-based BBSes to be extraordinarily popular in China (Comsenz 2005).

A successful virtual community brings many benefits and values to organizations. For example, a sustainable customer virtual community can decrease the cost of customer retention and customer service, increase product sales and customer satisfaction, and build a stronger brand (Banks and Daus 2002; Wenger et al. 2002). An employee communities of practice not only facilitates knowledge flow between geographically dispersed coworkers within organizations (Constant et al. 1996), but also helps employees to access to external knowledge resources cross organizational boundaries (Lee et al., 2006; Tedjamulia and Olsen 2005; Wasko and Faraj 2005). Past research however found that most virtual communities are facing the problems with retaining members and motivating them for active participation (Sangwan 2005). How to maintain a sustainable virtual community remains as an appealing question for both researchers and practitioners. Research on virtual communities, however, still focused a lot on user adoption and initial use of this online social space. (e.g., Bagozzi and Dholakia 2002; Dholakia et al. 2004; Sussman and Siegal 2003; Wasko and Faraj 2005). In order to fill this research gap, we will develop and empirically test a theoretical research model, and to determine the significant factors affecting user intention to continue using a virtual community (especially the BBS), with the specific focus on user intention to continue adopting information.

The rest of this paper is organized as below. The next section provides a review on the literature related to information systems continuance and information adoption. The third section describes the research model and hypotheses. Then the research methodology is described. The last section summarizes the findings and discusses the implications for both research and practice.

2 THEORETICAL BACKGROUND

In order to understand the sustainability of virtual communities in general, and user intention to continue adopting information in virtual communities in particular, we provide a review on literature of information system continuance (IS continuance) and information adoption.

2.1 Information System Continuance

Information system success depends on whether users are willing to continue to use a particular information system. A lot of attentions have been paid on information system continuance in recent years (e.g., Bhattacherjee 2001; Hsu et al. 2004; Tiwana and Bush 2005). Bhattacherjee (2001) developed an IS continuance model in line with the expectation confirmation theory and presented a new set of variables specific to the IS post adoption, arguing there are substantive differences between adoption and continuance behavior. Bhattacherjee's (2001) "post-acceptance model of IS continuance" seeks to explain user intention to continue using an information system (see Figure 1).
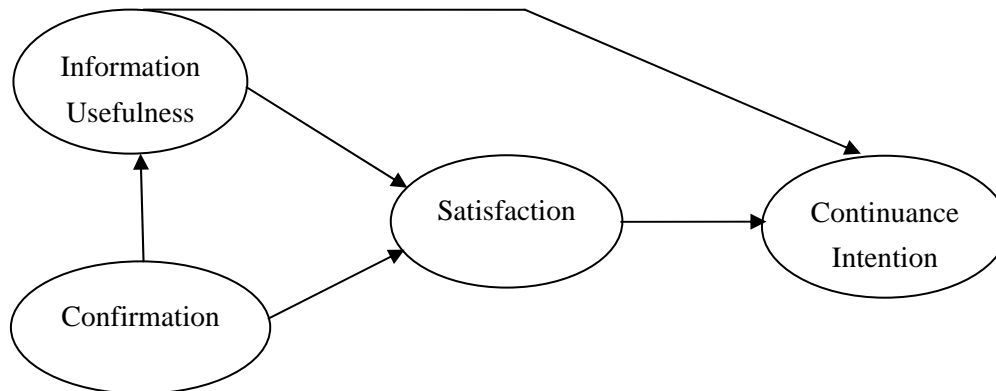

Figure 1.   IS Continuance Model (Bhattacherjee 2001)

This model employs the expectation confirmation theory from customer behavior literature and emphasizes the differences between "acceptance" and "continuance" and explain the phenomenon of "acceptance-discontinuance anomaly" (i.e., user discontinuance of IS after its initial acceptance)". The model focuses on users' post-acceptance "psychological motivations", i.e., confirmation and satisfaction, while ex post perceived usefulness and user satisfaction of an information system are two significant antecedents of IS continuance intention, and confirmation is the antecedents of both perceived usefulness and user satisfaction.

In the context of virtual communities, usage behavior involves both information sharing (e.g., posting questions and answers, experience sharing, etc.) and information adoption (e.g., reading messages, seeking information, using knowledge from the forum, etc.), and the sustainability of a virtual community depends on both the supply and demand of information. As the decision to contribute and share information with others and the decision to adopt and use information in a web-based BBS may involve different motives driving the behavior, a generic model for IS continuance may not provide enough insights to explain why users are willing to continue contributing and adopting information in a virtual community.

2.2 Information Adoption

Based on theories of informational influence, Sussman and Siegal (2003) developed an information adoption model to explain the process of adopting received messages in the context of computer-mediated communication technologies. This model highlights that the mediating effects of information usefulness between the dual cues of message (i.e., argument quality and source credibility) and user intention. It posits that information usefulness is the key direct antecedent of information adoption. Information usefulness is, in turn, influenced by argument quality and source credibility (Sussman and Siegal 2003). Argument quality (i.e., information quality) is identified as the extent to which users think that information is relevant, timely, accurate and complete. It reflects the features of the content contained in a message. Source credibility represents the extent to which users think that they can trust

the piece of information or they believe that it is contributed by an expert (Rieh 2002). It offers the heuristic information evaluation and reflects the characteristics of the source who offer the information (see Figure 2).
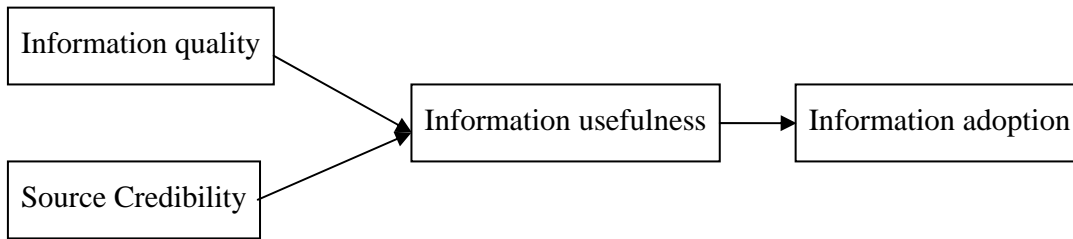

Figure 2.   Information Adoption Model (Sussman and Siegal 2003)

Virtual communities have become information sources of numerous topics (e.g., tourism, health care, and web development.). Prior research on the motivations for using virtual communities found that informational needs explain most of the variance of the use of virtual communities. For instance, Tedjamulia and Olsen (2005) claimed that the benefit from using a virtual community is to enlarge social networks and to get more widespread community information. Ko, Cho and Roberts (2005) found that users who had higher information motivations for using the Internet were more likely to continue staying in a web site and engage in "human-message interaction". Accordingly, information adoption is one of the most salient needs that users want to fulfill by participating in virtual communities.

3   RESEARCH MODEL AND HYPOTHESES

This study attempts to explain user intention to continue adopting information in virtual communities. Building upon Bhattacherjee's IS continuance model (2001) and the information adoption model (Sussman and Siegal 2003), the research model is developed and empirically tested in the context of Internet bulletin board-based communities. Figure 3 depicts the research model of this study. The constructs and their relationships are discussed in the following sections.
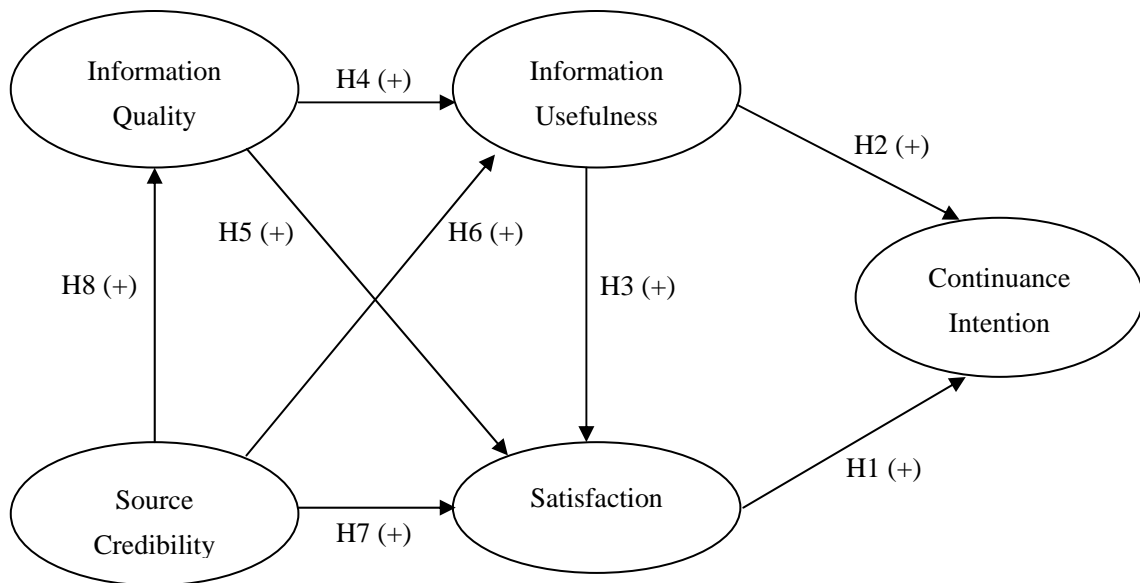

Figure 3.   Research Model of User Intention to Continue Using the Virtual Community

3.1 User Satisfaction

User satisfaction is defined as an emotional affect toward the outcome of using a virtual community (e.g., web-based BBS community) (DeLone and McLean 1992; DeLone and McLean 2003). Past research showed that satisfaction is the key determinant of IS success (DeLone et al. 1992; Aua et al. 2002) and IS continuance intention (Bhattacherjee 2001). Tiwana and Bush (2005) further argued that satisfaction is the most salient determinant of user intention to continue using expertise-sharing networks. Hsu et al. (2004) also found that the more an individual user is satisfied with the prior usage experience, the higher the chance that he will continue to use the World Wide Web. Consistent with these studies, we infer that user satisfaction with prior use of a virtual community has a strong and positive impact on user intention to continue using the virtual community for adopting information. Thus, we have the following hypothesis:

H1: Satisfaction with the use of virtual community has a positive affect on users' continuance intention to use the virtual community for the sake of information adoption.

3.2 Perceived Information Usefulness

Bhattacherjee (2001) urged that "usefulness impacts attitude substantively and consistently during stages of IS use", while "ease of use has an inconsistent effect on attitude in the initial stages, which seems to further subside and become non-significant in later stages." Accordingly, only ex post perceived usefulness is adopted as the predictor of satisfaction and IS continuance intention in the IS continuance model. Information usefulness captures the degree to which the information is perceived valuable, informative and helpful (Sussman and Siegal 2003). It is a dominant determinant of user adoption in Internet usage experience (Zhang et al. 2000; McKinney et al. 2002). In accordance with these observations, we hypothesize that the higher a user perceives the information posted in the virtual community to be useful, the more satisfied he will be with the virtual community and the more likely that he will continue to adopt the information in the virtual community. Thus, we have the following hypotheses:

H2: Perceived information usefulness has a positive effect on users' continuance intention to use the virtual community for the sake of information adoption.

H3: Perceived information usefulness has a positive effect on users' satisfaction with the use of virtual communities.

3.3 Perceived Information Quality and Source Credibility

Drawing upon DeLone and McLean's IS success model (1992), information quality has a significant effect on IS use and user satisfaction. Information quality refers to the timeliness and value of the content of the information in virtual communities (Leimeister et al. 2004). Prior research showed that web information quality has a significant relationship with customer satisfaction (McKinney et al. 2002; Hsu 2006) and information usefulness (Sussman and Siegal 2003). Out-dated, irrelevant, incomplete or inaccurate information will make users lose their confidence in the usefulness of the virtual community, become unsatisfied with their usage experiences, and thereby withdraw from using the virtual communities. Consistent with these observations, information quality is expected to positively affect information usefulness and user satisfaction. Thus, we have the following hypotheses:

H4: Information quality has a positive effect on perceived information usefulness.

H5: Information quality has a positive effect on users' satisfaction with the use of virtual communities.

Source credibility represents the informational authority, and it serves as the informational indicator when people cannot distinguish good messages from bad ones (Sussman and Siegal 2003). Besides

information quality, source credibility is another criterion to assess Internet information. If they find that the contributors of the posted messages are identified as trustworthy experts, participants tend to consider the information provided in a VC useful and credible, just like readers believe the news published in authorized newspapers valuable and convincing (Donath 1999). In recent years, source credibility has also been testified to be another predictor (besides information quality) of information usefulness and satisfaction (Sussman and Siegal 2003; Bhattacherjee and Sanford 2004). Further, source cue is the heuristic judgment of information quality (Rieh et al. 1998). That means information from identified trustworthy experts will be perceived to be of high quality in the context of virtual communities. Thus, we have the following hypotheses:

H6: Source credibility has a positive effect on perceived information usefulness.

H7: Source credibility has a positive effect on users' satisfaction with the use of virtual communities.

H8: Source credibility has a positive effect on information quality.

4 RESEARCH DESIGN

4.1 Data Collection

In order to validate our research model, we posted a self-administrative online English questionnaire in three sub-categories of a web-based BBS owned by a local university in mainland China. Preventive measures (i.e. reject two pieces of data with the same IP address) were used to avoid repetitive completion of the questionnaire by the same respondent. Compared to traditional paper-based survey, online survey has little missing data, more accurate and time economic data entry, and more reliable and valid data (Boyer et al. 2002). To encourage more participation, incentives of USB memory drives were offered as lucky draw prizes among respondents. The response rate is 18.1% (240 reponses/1327 views) according to the method suggested by Tiwana and Bush (2005) for counting online response rate. Among these respondents, 77.1% were male and 22.9% were female. This ratio is similar to the ratio of male to female students in the university. A majority of the respondents aged between 21 and 25 and had a bachelor degree or above. They were also frequent and experienced users of the BBS. Around 80% of them visited the BBS everyday and the average usage experience with the BBS was more than 3 years. A t-test showed no significant difference between the respondents from the three different sub-categories on which the questionnaire was posted.

4.2 Measures

Constructs in the research model were all measured by using multiple-item scales adopted from previous studies with minor modifications to ensure contextual consistency. The scale items used seven-point semantic differential scales. Items that had low loadings on the corresponding construct were eliminated to enhance reliability. Table 1 shows the measures of all the constructs and their sources.

Construct	List of items	Sources
Continuance intention (CI)	Please express the degree to which you might intend to continue using of the BBS for the sake of information adoption in the next few weeks. CI1: very unlikely/ very likely. CI2: strongly unlikely-strongly likely.	Bagozzi and Dholakia 2002
BBS-User Satisfaction (SAT)	How do you feel the overall experience with the BBS? SAT1: very dissatisfied/very satisfied. SAT2: very displeased/very pleased.	Bhattacherjee 2001

	SAT3: very frustrated/very contented. SAT4: absolutely terrible/absolutely delighted.	
Information usefulness (IU)	Please rate the content of the messages in the BBS. IU1: invaluable/valuable. IU2: uninformative/informative. IU3: harmful-helpful.	Sussman and Siegal 2003
Information Quality (IQ)	Based on your experience of using the BBS, please provide your evaluation of the quality of information in the BBS. IQ1: useless/useful. IQ2: irrelevant/relevant. IQ3: inappropriate/appropriate. IQ4: inapplicable/applicable. IQ5: out-date/current. IQ6: insufficiently timely/sufficiently timely. IQ7: insufficiently out-of-date/sufficiently out-of-date. IQ8: inaccurate/accurate. IQ9: incorrect/correct. IQ10: unreliable/reliable. IQ11: incomplete/complete. IQ12: The information in the BBS is sufficiently complete for my needs. (disagree/agree) IQ13: The information in the BBS includes all necessary values. (disagree/agree) IQ14: The information in the BBS covers my need. (disagree/agree) IQ15: The information in the BBS has sufficient breadth and depth. (disagree/agree)	Lee et al. 2002
Source Credibility (SC)	Based on your experience of using the BBS, please provide your evaluation of the people who write messages in the BBS. SC1: not very knowledgeable/very knowledgeable. SC2: not expert/expert. SC3: not trustworthy-trustworthy. SC4: not reliable/reliable.	Sussman and Siegal 2003

Table 1. Constructs and Sources

5   DATA ANALYSIS AND RESULTS

Data analysis was performed using Partial Least Squares (PLS), a structural equation modeling technique prevalent used in recent years. PLS allows researchers to analyze simultaneously both how well the measures relate to each construct and how the independent variables influence the dependent variable. Moreover, PLS does not require a normal distribution of the data and is applicable to small sample (Chin 1998), making it most appropriate for this study.

5.1   Assessment of the Measurement Model

Convergent validity, which indicates the extent to which the items of a scale that are theoretically related to each other relate to each other in reality, was verified by examining the internal consistency reliability (ICR) and the average variance extracted (AVE). Acceptable values of ICR and AVE should be greater than 0.7 and 0.5 respectively (Fornell et al. 1981). As Table 2 shows, all ICR and AVE values of the items meet the recommended threshold and almost the entire factor loadings are more than 0.70 except one of the items of Information Quality (i.e., IQ15).

	Item Loading	Means	Standard Error	t-statistics
Information Quality	IQ CR = 0.96 , AVE = 0.62			
IQ1	0.81	1.38	0.03	31.60
IQ2	0.81	1.35	0.03	28.48
IQ3	0.85	1.31	0.02	37.63
IQ4	0.84	1.27	0.02	33.41
IQ5	0.80	1.37	0.04	21.92
IQ6	0.79	1.20	0.04	17.57
IQ7	0.83	1.14	0.03	26.56
IQ8	0.80	1.19	0.03	22.98
IQ9	0.83	1.25	0.03	30.13
IQ10	0.80	1.32	0.04	23.72
IQ11	0.78	0.97	0.04	22.57
IQ12	0.73	0.80	0.04	18.82
IQ13	0.70	0.60	0.04	16.32
IQ14	0.72	0.62	0.03	18.54
IQ15	0.65	0.57	0.04	15.52
Source Credibility	SC CR = 0.91 , AVE = 0.72			
SC1	0.84	0.88	0.03	33.17
SC2	0.83	0.75	0.02	34.85
SC1	0.87	1.05	0.02	46.71
SC2	0.87	1.02	0.02	46.86
Information Usefulness	IU CR = 0.92 , AVE = 0.80			
IU1	0.90	1.00	0.02	56.28
IU2	0.90	1.09	0.02	45.77
IU3	0.88	1.04	0.02	38.30
User Satisfaction	SAT CR= 0.92 , AVE = 0.75			
SAT1	0.87	0.67	0.02	41.91
SAT2	0.88	0.90	0.02	38.96
SAT3	0.85	0.74	0.03	26.75
SAT4	0.86	0.77	0.03	27.68
Continuance Intention	C I CR = 0.97 , AVE = 0.94			
CI1	0.97	1.70	0.01	156.00
CI2	0.97	1.67	0.01	176.32

Table 2. Psychometric Properties of Measures
Note: CR - Composite Reliability, AVE - Average Variance Extracted

Discriminant validity measuring whether a given construct is different from other constructs was assessed by one criterion: the square root of AVE for each construct should be greater than the correlations between the construct and other constructs (Fornell et al. 1981). It is easily seen from table 3 that all AVE values are greater than the off-diagonal elements in the corresponding rows and columns, demonstrating discriminant validity.

	AVE	IQ	SC	IU	SAT	CI
IQ	0.62	0.79				
SC	0.72	0.76	0.85			
IU	0.80	0.72	0.72	0.89		
SAT	0.75	0.42	0.48	0.48	0.87	
CI	0.94	0.44	0.45	0.45	0.60	0.97

Table 3. Correlation Matrix and Psychometric Properties of Key Constructs
Notes: Shaded diagonal elements are the square root of AVE for each construct Off-diagonal elements are the correlations between constructs

5.2   Assessment of the Structural Model

The examination of the structural model involves estimating the path coefficients, which represent the strengths of the relationships between the dependent and independent variables, and the R-square values, which stand for the amount of variance of dependent variables explained by their antecedents. Together, the R-square values and the path coefficients (loadings and significance) demonstrate how well the data testify the research model. Figure 4 presents the results of the PLS structural model assessment with the overall explanatory power, the estimated path coefficients (all significant paths are indicated with an asterisk), and the associated t-values of the paths. Tests of significance of all paths were performed using the bootstrap resampling procedure.
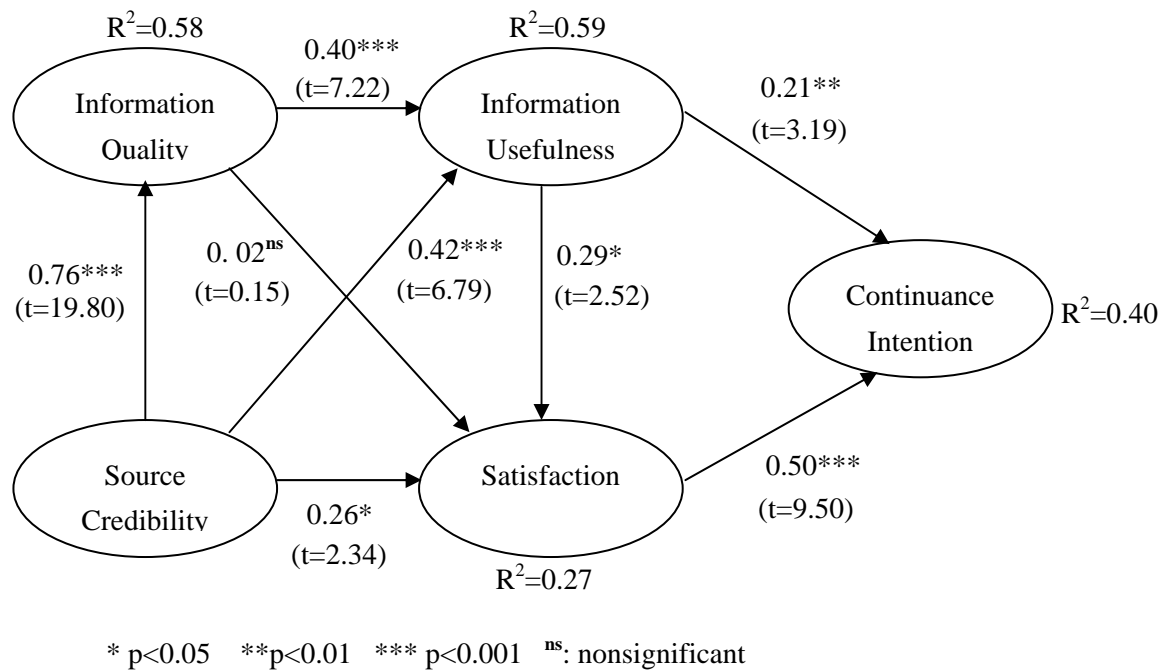

* p<0.05   **p<0.01   *** p<0.001   ns: nonsignificant

Figure 4. PLS Results

As shown in Figure 4, the model explains 40% of the variance in continuance intention of information adoption in a virtual community. Both satisfaction and information usefulness have significant impacts on continuance intention, with path coefficients at 0.50 and 0.21 respectively, providing support to Hypotheses 1 and 2. Satisfaction is significantly explained by information usefulness ($\beta = 0.29$) and source credibility ($\beta = 0.26$), providing support to Hypotheses 3 and 7 respectively. Surprisingly, information quality does not influence satisfaction significantly. All the variables explain 27% of the variance of user satisfaction with the use of the virtual community. Information usefulness is significantly explained by both information quality ($\beta = 0.40$) and source credibility ($\beta = 0.42$), supporting the Hypotheses 4 and 6 respectively. Finally, source credibility is strongly related to information quality, with path coefficient at 0.76.

6   DISCUSSION AND CONCLUSION

This study aims at understanding the sustainability of virtual communities in China, specifically, we attempt to find out what drives people to continue using the web-based BBSes in China for information adoption. We proposed a research model by integrating the key concepts of IS

continuance model and the information adoption model. Our results showed that the measures of the measurement model were confirmed with adequate levels of convergent and discriminant validity. Also, the structural model explained 40 percent of the variance and most paths were significant as hypothesized. This study is one of the very first studies on the continued use of virtual communities for information adoption in China and we believe that it will contribute to both the conceptual understanding of continuance of virtual communities and the practical guidelines for maintaining a virtual community.

6.1   Implications for Researchers

The major contribution of this study is twofold. First, while past studies on virtual communities largely focused on user initial adoption and usage behavior, this study moves forward and further identifies the factors that drive users to continue using virtual communities for information adoption. The research model provides new insights in understanding IS continuance. In particular, this study examined the continued use of virtual communities for information adoption.. This study builds upon the IS continuance model and information adoption model and explains user intention to continue using the web-based BBSes for information adoption. The model explains about 40 percent of the variance, future studies should continue to identify important factors determining user continuance intention in virtual communities.

Second, this study finds that the role of information quality in explaining user satisfaction with virtual communities may not be as important as in traditional end-user computing environment. Our results show that information quality does not have a significant direct impact on user satisfaction with the use of a virtual community. In end-user computing satisfaction literature, the relationship between information quality and user satisfaction is very well established, and the relationship is further confirmed in the context of internet shopping and electronic commerce, where information quality of the website content affects user satisfaction with online stores. One possible explanation of this insignificant finding is that in the information-based virtual community, members mostly use the virtual community with a specific purpose, which is to look for useful information. They expect to get something that is directly useful for them to make decision. In addition, this type of web-based virtual community normally comprises of members of strangers. Most users do not have very high expectations on the information quality of the virtual community. When they come to the decision to continue to adopt the information, the usefulness of the information, as well as the credibility of the source will play a more important role to determine both user satisfaction and continuance intention. Future studies should continue to explore this issue with the specific focus on the nature of the virtual communities used by the public against functional information systems used in organizations.

6.2   Implications for Practitioners

Users' continuance participation in VC spaces can bring many benefits to organizations from the perspectives of both consumers and employees. However, if they do not keep on participating in the virtual community, these benefits cannot be realized. In this study, source credibility plays an important role in explaining user satisfaction, information quality, as well as information usefulness. The community designers should enhance the perception of the credibility of the message contribution by offering a recognition mechanism, where participants can get recognized for their expertise during their participation and contribution. They should also include some features that can increase members' familiarity with other users, for example, allowing them to put their personal profile.

Information usefulness has a significant impact on both user satisfaction and user continuance intention in using the virtual community for information adoption. Community designers should provide a rating system where other members can review and rate other people's posted messages regarding the messages' usefulness. Similar to Amazon.com, they asked other users to review and rate the usefulness of the comments in the customer review sections.

Finally, user satisfaction remains as the most important factor in determining user intention to continue using the virtual community for information adoption. Community designers should regularly conduct surveys to examine user satisfaction level.

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