ABSTRACT

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Abstract

This research for this thesis aimed to determine the drivers for young adults' continued knowledge sharing in virtual academic communities (VACs), and to help VACs managers identify significant factors that affect young adults. Smart Partial Least Squares (PLS) path modelling was used to analyse the research data. On the basis of the data analysis, hypotheses were judged, and results were analysed. Finally, this thesis offered a conclusion of drivers for young adults' continued knowledge sharing in Chinese VACs.

This is a quantitative research project based on a survey. After reviewing the prior research about continued knowledge sharing and VACs. This study primarily discusses the definition of VACs. Next, the similarities and differences between the representative Chinese and global VACs are illustrated. Based on theories and research status, the research model is built in the third chapter. The main body of the model was built based on the expectation-confirmation model of IS continuance (ECM-IS). The IS success model is the basis upon which to add external variables: reputation (RE), social relationships trust (SRT), academic information quality (QL), academic information quantity (QT) and user interface (UI). In this research model, electronic survey questionnaires were distributed, and data were collected from young adults who have used Chinese VACs. By using the SmartPLS3.0 software program, PLS and bootstrapping algorithms were used to test the construct's reliability, validity and significance. At the end of this study, it verifies whether the hypotheses are correct, and concludes the thesis in accordance with the aforementioned explanations and data analyses. Also, discussions and limitations are presented.

Through this research, it was found that RE, QL, QT and UI are four drivers for young adults' CoB. Moreover, RE and SRT are two factors that influence young adults' perceived usefulness (PU). And then, CoB and PU are both influence factors of satisfaction (SA). Next, SA and PU may influence the continued knowledge sharing (CKS) in directly. Of the above influence factors, satisfaction is the most important one affecting young adults' continued knowledge sharing.

Key words	Continued knowledge sharing, virtual academic communities, influence factors, young adults, structural equation modelling
Further information	

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University of Turku

CENTRAL CHINA NORMAL UNIVERSITY

DRIVERS FOR YOUNG ADULTS' CONTINUED KNOWLEDGE SHARING IN CHINESE VIRTUAL ACADEMIC COMMUNITIES

Master's Thesis
in Information Systems Science (UTU)
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ABBREVIATIONS

AVE	Average variance extracted
BBS	Bulletin board system
CBSEM	Covariance-based SEM
CFA	Confirmatory factor analysis
CKS	Continued knowledge sharing
CoB	Confirmation of beliefs
CoP	Communities of practice
CR	Composite reliability
ECM	Expectation-confirmation model
ECM-IS	Expectation-confirmation model of IS continuance
ECT	Expectation-confirmation theory
IS	Information system
IT	Information technology
PLS	Partial least squares
PU	Perceived usefulness
QL	Academic information quality
QT	Academic information quantity
RE	Reputation
SA	Satisfaction
SD	Standard deviation
SEM	Structural equation modelling
SRT	Social relationship trust
TPB	Theory of planned behaviour
TRA	Theory of reasoned action
UI	User interface
VAC	Virtual academic community
vCoP	Virtual communities of practice

1 INTRODUCTION

1.1 Research interest

In the 21st century, our society has been called a global knowledge-economic society, which is accompanied by technological, economic and social challenges (OECD, 2001). In this economic society, knowledge plays an important role in people's daily life and social development. Not surprisingly, people want to find an effective way to search, gain and share knowledge quickly and easily. Virtual communities are good choices for this in the information era (Wagner & Bolloju, 2005).

Following Hill, Stead, Rosenstein and Furnas (1995), the term *virtual community,* in essence, refers to a group of people who have common characteristics communicate with each other through the Internet. In this era of networking, people can use virtual communities to explore, combine and interconvert tacit and explicit knowledge (Bieber et al., 2002). Prior research has shown that virtual communities can give people a sense of belonging and allow them to find friends with the same interests (Blanchard & Markus, 2002).

According to various standards, virtual communities can be divided into different themes. Classified by the basic needs of humans, Hagel (1999) named three types of virtual communities: personal interests, demographic-geographic and business-to-business. Based on different operation models, Moore and Serva (2007) have also divided virtual communities into three types: wiki, blog and Internet forums. A virtual academic community (VAC) is a type of virtual community whose main goal is to promote academic exchanges in an online environment (Chen & Qi, 2015).

In China, not only do professors and scholars use VACs, young people (such as students and young academics) like to use them (Xu & Yuan, 2013). Today, many academic leaders prefer to use open access to share research achievements in Chinese VACs, and young researchers like to find research frontiers by following academic leaders. For example, Citespace is a free and very popular visualization co-citation network software (C. Chen, 2006), and the developer, Professor Chaomei Chen, has explained all the site's capabilities and features at ScienceNet.cn, the science virtual community. Also, researchers who have questions about Citespace can find answers on Professor Chen's page.

Recently, only a few researchers have combined continued knowledge sharing with VACs. When the research subjects narrowed to Chinese young adults, a gap between continued knowledge sharing and VACs was evident. Thus, there is a need for further

research to investigate the relationship between young adults continued knowledge sharing and Chinese VACs.

1.2 The motivation and purpose

The motivation for this research originated from two different streams of research: continued knowledge sharing and VACs. Compared with the research available about virtual communities or knowledge sharing, little research has connected both aspects with Chinese young adults.

When talking about research motivation, the importance of continued knowledge sharing in VACs is a key motivation for conducting the research. In this so-called information age, knowledge and knowledge management are more important than ever before. Knowledge sharing is one of the most important aspects of knowledge management (Serban & Luan, 2002). Academic knowledge is complex and sometimes difficult to understand. Thus, the biggest challenge to VACs is supplying knowledge (Chiu, Hsu & Wang, 2006), especially academic knowledge.

Furthermore, the primary users of VACs are students, professors and scientific research workers, who have a great need for academic knowledge. Most of the young users from 18 to 40 years of age play an important role in VACs. They prefer to use VACs to seek and share knowledge. And now, more and more young scholars are joining various VACs. VACs create close academic environments where young adults have a chance to gain knowledge related to their research field (Nistor, Baltes, Dascălu, Mihăilă, Smeaton & Trăuşan-Matu, 2014). Contined knowledge sharing in VACs is like a knowledge fountain, which will help VACs operate well.

The research purpose of this thesis is to explore significant factors which may affect young adults' behaviour toward continued knowledge sharing in Chinese VACs. Many resources are available for users to seek, collect and share in VACs (Chen & Qi, 2015). The beginning of this thesis will give an overview of the theoretical framework of continued knowledge sharing. In addition, based on prior research and hot spots, a model for young adults' continued knowledge sharing in Chinese VACs will be constructed. At the end of the study, insights into the influence factors of Chinese VACs will be provided. After all this, however, some suggestions for improvements will be given for Chinese VACs.

1.3 Research question

In this research topic, four keywords have been noted: influence factors, young adults, continued knowledge sharing and Chinese VACs. The research question is as follows:

What drives young adults' continued knowledge sharing in Chinese virtual academic communities?

This question will be answered considering the literature review, as well as the quantitative research results. After showing the importance of knowledge sharing in the motivation and purpose of this study, this thesis makes a detailed analysis of influence factors in previous research.

Before analysing the correlation among the influence factors, a research model about continued knowledge sharing will be built based on the hypotheses. This question will be answered in Chapter 3 and 4 by identifying relationships among the influence factors and verifying the hypotheses. Based on the research model, important influence factors will be found, and the expected contribution to theory and practice will be demonstrated at the conclusion of the research.

1.4 Research procedure

This study will use a quantitative research method and structural equation modelling (SEM) to identify the influence factors which drive young adults' continued knowledge sharing in Chinese VACs. In VACs, young adults play an important role in knowledge sharing processes. This work begins by defining VACs, providing some examples of VACs and noting the differences among various types of VACs. After defining continued knowledge sharing, the research model and influence factors of continued knowledge sharing will be noted. Additionally, based on the literature review, the shortcomings and limitations evident in previous articles will be shown at the conclusion of the theory section. By building a research model of continued knowledge sharing in Chinese VACs, this research will attempt to fill the aforementioned gap in the research.

In the empirical part of this research, hypotheses will be put forward according to the research model. After administering a questionnaire and collecting data, this study will use SEM and partial least squares (PLS) path modelling to analyse the data. Based on the analysis results, the value of the hypotheses will be judged. Finally, before presenting the suggestions for users and VACs, the results will be discussed.

This research encompasses three stages as follows. Stage 1: Confirm the idea and questions. At this stage, research questions will be identified, the research proposal will be prepared and the literature review will be conducted. Stages 2 and 3 contain the

empirical parts of this thesis. In these stages, the research model will be designed, and questionnaires will be developed and distributed to participants. Data will be collected, analysis will be conducted and results will be presented in Stage 3. At the end of the thesis, the implications of the study and its strengths and limitations will be discussed. The research procedure is shown below (See Figure 1).

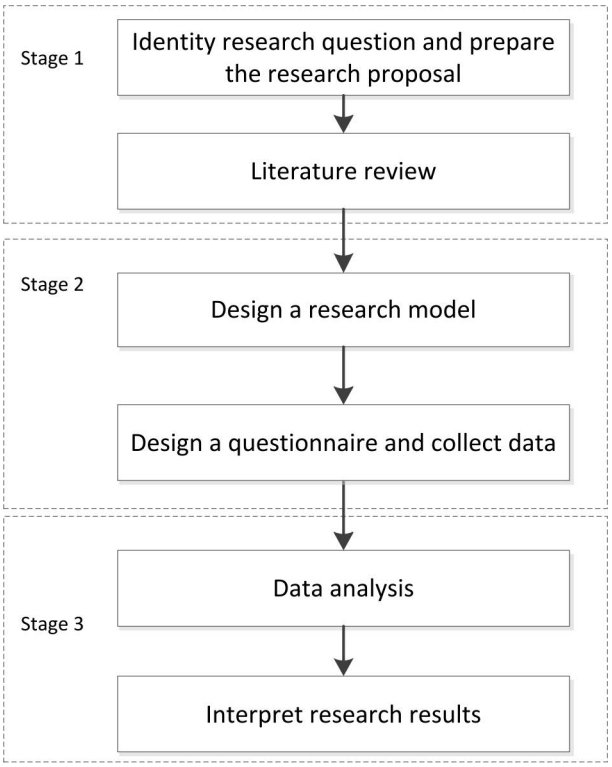

Figure 1 Research procedure

2 LITERATURE REVIEW

This chapter will introduce the theoretical concepts and the literature review. Firstly, there is a brief introduction to VACs and knowledge management. Next, previous research theories about continuance intention and knowledge sharing in VACs will be discussed. Finally, the concept of expectation-confirmation theory (ECT) and IS success model are shown.

2.1 VACs

2.1.1 Definition of VACs

Based on the literature, there is no universally accepted definition of VACs, and different people have different ideas about their meaning. People have also called VACs by other names, such as online/virtual learning communities (M. C. Lee, 2010; Hew, Latifah & Abdul, 2016; M. Zhang, Liu, Yan & Zhang, 2017), academic virtual communities (Hassandoust, Logeswaran & Farzaneh Kazerouni, 2011; Chen & Qi, 2015) or virtual communities of practice (vCoPs) (Nistor et al., 2014).

Liu, Chen, Sun, Wible and Kuo (2010) illustrated that an online learning community enabled learners to access up-to-date information via the Internet at anytime, anywhere. Giddens, Hrabe, Carlson-Sabelli, Fogg and North (2012) said that VACs were an emerging pedagogical application. Students can become more interested in learning by using these kinds of applications. Elliot, Rubin, DeCaro, William Clymer, Earp and Fish (2013) highlighted the tutorial value of VACs with synchronous and remote tutoring service, especially for science, technology, engineering and mathematics (STEM) students who are deaf or hard of hearing.

The term *communities of practice* (CoPs) was coined by Jean and Wenger (1991). It postulates that CoPs are groups of people who share a concern or a passion for a common thing. The aim of this type of group is to find a way to do something better by interacting regularly with others (Wenger, 2011). Nistor et al. (2014) thought that VACs are similar to vCoPs and supported vCoPs as effective environments for knowledge creation and knowledge sharing.

In order to promote academic exchanges and interaction, VACs have become network-based academic platforms, exchanging information and sharing knowledge (Thelwall, M. & Kousha, 2014; M. Chen & Qi, 2015). Furthermore, when analysing the relationship between electronic governance and VACs, Mulkey, Dougan and Steelman (2005) found

that many factors can influence users' behaviours, such as the need for loyalty and expertise.

This research mainly focuses on the interaction function of VACs, rather than the teaching function. Users have opportunities to communicate with others and share knowledge by using blogs, posts or messages. VACs have three primary characteristics: interaction via the Internet, up-to-date information, knowledge sharing and creation. Considering the previously mentioned definitions, this thesis defines the concept of *VACs* as follows:

> *"A VAC is an effective environment of academic knowledge sharing and creation. Groups of people who share the same concern or passion can access up-to-date information via interaction without any physical constraint" (Liu et al., 2010; Wenger, 2011; Nistor et al., 2014; Chen & Qi, 2015).*

2.1.2 VACs in China and globally

VACs exist throughout the world. Hence, a brief introduction to VACs will be presented, and some representative VACs in China and globally will be described.

In China, Two of the most popular VACs are XiaoMuChong and ScienceNet. XiaoMuChong is an integrative and multi-domain VAC based on the bulletin board system (BBS) forum (Wang, Meng & Wang, 2013; Tang & Ding, 2014). Chinese university students and scholars at academic institutes like to use it to find and share academic knowledge. Users can post information to help others or answer others' questions in BBS.

ScienceNet was introduced in 1980 by the Chinese government. The goal of this VAC is to build the largest and the most influential global Chinese scientific communities. In fact, ScienceNet is not only a VAC, it is more like a full-featured website. It includes BBS, blogs, news, conference reports, recruiting and publications.

Compared with VACs in China, ResearchGate and Mendeley are representative virtual communities around the world. ResearchGate—a global VAC—today has more than 13 million members. This academic social network was created in May 2008 (Martín-Martín, Orduna-Malea, Ayllón & Delgado López-Cózar, 2016), and its mission, as stated in its slogan, is to discover scientific knowledge and to make research public.

Mendeley is a social reference manager created in August 2008 (Martín-Martín et al., 2016), and its primary function is to insert citations and automatically generate a bibliography from the Mendeley library. People can also create a new group, exchange ideas and share documents with colleagues and peers.

Table 1 Functions of four VACs

Functions	***ScienceNet***	***XiaoMuChong***	***ResearchGate***	***Mendeley***
Share your academic publication	√		√	√
Academic Groups	√			√
Connect and collaborate with colleagues	√	√	√	√
Get stats/ dataset			√	√
Ask question, get answers	√	√	√	√
Find the right job	√	√	√	√
Blog	√			

We retrieved the four abovementioned Chinese and global VACs websites. Their functions are summarized in Table 1. Because of the differences in cultures and website goals, Chinese VACs and global VACs possess similarities, as well as differences. Chinese and global VACs have many similarities. Firstly, people can share knowledge and exchange ideas without time and space limitations. For example, ResearchGate has a specific blog to list current projects, and users in ScienceNet have their own blogs as well. Secondly, many academic leaders have their own accounts in VACs, and people can send messages to them and access full-text articles for free (Jamali, 2017). This is mutually beneficial for scholars and students who want to find papers which are expensive in other databases (Chen & Qi, 2015).

As expected, there are also some differences between Chinese VACs and global VACs. By comparing the communities' functions, different VACs have different characteristics. In Table 1, it can be seen that ScienceNet and ResearchGate are more comprehensive VACs. But, on Mendeley, academic groups can be formed, whereas they cannot on ResearchGate. XiaoMuChong is a BBS, so the interaction between users will be more active, while Mendeley pays more attention to citations and is a very popular reference software.

With the development of VACs, more user demands have become known. VACs have added many new functions, such as the alumni circle (a group of schoolmates), Q&A about applying for doctorate or masterate and employment resources. Compared with Chinese VACs, global VACs, such as ResearchGate and Mendeley, pay more attention to shared articles, academic communication, conferences and job hunting. They focus on academic information, and most of the users are scholars and professors.

2.1.3 Young adults in VACs

In considering Erikson's stages of human development, Briner (2006) illustrated that young adulthood (from 20 to 39 years of age) precedes middle adulthood. However, people who are 18 to 40 years of age are defined as young adults in psychology and medicine. In China, based on the constitution of the All-China Youth Federation, young adults are considered to be those from 18 to 40 years of age. In this thesis, that definition is employed.

Young adults are more willing to accept new ways of acquiring knowledge than older people, for example, the use of online learning (Cercone, 2008). When compared with children, young adults are more autonomous, and they have the capability of self-control and self-direction. Compared to the elderly, they have a strong motivation to learn and share. Also, most importantly, they prefer to use the Internet to discuss and interact with one another. This younger group has more vitality and energy than older groups (Cooke, 2004).

With the increasing number of people who use virtual communities, these websites are preferred by young people for interaction with others (Pelling & White, 2009). In VACs, young adults play a vital role. Urista, Dong, Day and Merkin (2009) demonstrated that young adults relied on the Internet for entertainment and information. In Singapore, Cheong (2008) illustrated that young adults had strong skills in Internet-related problem-solving. Subrahmanyam, Reich, Waechter and Espinoza (2008) also found that young people preferred to use virtual communities to connect and reconnect with friends. These are the reasons why I chose young adults as the research subjects for this study.

2.2 Continued knowledge sharing

2.2.1 Knowledge and knowledge management

When talking about data, information and knowledge, information is data contained within a context, and knowledge is information processed by the brain (Van Beveren, 2002). Ackoff (1989) also illustrated that information is composed by processed data. In his research, information is contained in descriptions, but knowledge is conveyed by instructions and answers how to solve problems.

Knowledge has potential advantages for organizations and individuals (Quintas, Lefrere, & Jones, 1997). After identifying and obtaining the appropriate knowledge for the right users, organizational and individual performance can be improved. Quintas, Lefrere and Jones (1997) connected knowledge with economies. They believe that

knowledge is a meaningful economic resource (Quintas et al., 1997). In order to use it effectively, knowledge should be well-managed by organizations, societies and individuals. In companies, knowledge is also known as intellectual capital and is extremely important to organizations (Civi, 2000). In this research, the definition of knowledge is similar to that suggested by Van Beveren (2002), who simply defined knowledge as an individual's stock of information, skills, experience, beliefs and memories. In other words, knowledge is a fluid mix of framed experience, values and contextual information (Davenport, Prusak & Webber, 1998).

As people have begun to pay more and more attention to the concept of knowledge, the study of knowledge management has gained attention. Quintas et al. (1997) stressed the importance of setting knowledge management as a primary goal. In order to meet emerging needs and demands, knowledge management is the process of continually managing knowledge. This process should identify, use and exploit acquired knowledge, and then create value for individuals, firms or society (Quintas et al., 1997). After presenting previous definitions of knowledge and knowledge management, this thesis defined *knowledge management* as follows:

> *"Knowledge management is a business process. In order to meet emerging needs and requirements, this business process aims to create and use of institutional or collective knowledge, and then create value for individuals, firms or society" (Quintas et al., 1997; Civi, 2000).*

Most definitions of knowledge management focused on what knowledge management might be, but Demarest made a conclusion about how to accomplish it. There are four systematic ways to manage knowledge: underpinning, observation, instrumentation and optimization (Demarest, 1997). Moreover, successful knowledge management can be measured in four dimensions: impact on business processes, impact on strategy, leadership and knowledge content (Jennex, Smolnik & Croasdell, 2009). For users, knowledge management can help them focus on what is important (Jennex & Olfman, 2004). Thus, a simple and clear successful knowledge management can provide a basis for individuals or organizations.

Different programs have different knowledge management frameworks. For high-technology research and development, knowledge management has a fixed framework. It includes four steps: knowledge application, knowledge acquisition, knowledge organization and knowledge dissemination (Parikh, 2001). In organizations, Zhang, Zhou and Nunamaker (2002) showed a knowledge management process which is used for decision-making. There are six steps for supporting knowledge management: acquisition, filtering, categorization, indexing and linking, knowledge creation, sharing and maintenance. In data mining programs, the knowledge management framework is a circle. Knowledge management starts with sampling and ends up with model assessment. Until the goals of decision achieved, the circulation stopped (Shaw, Subramaniam, Tan &

Welge, 2001). Shaw et. al (2001) also mentioned that the first step in integrating knowledge management systems is to share knowledge.

2.2.2 Definition of continued knowledge sharing

In the process of knowledge management, knowledge sharing is the main part of knowledge management (Jie & Zhengang, 2010). This study plans to do research about continued knowledge sharing. It will examine continuance intention and knowledge sharing. Many researchers have defined knowledge sharing and continuance intention. However, researches on continued knowledge sharing are rare (He & Wei, 2009).

As for continuance intention, continuance is defined as the state of continuing to exist or function. Many prior studies have shown the factors that influence continuance. By finding these influence factors, people may gain a better understanding of continuance intention. Roca, Chiu and Martinez (2006) showed that continuance intention could be decided by satisfaction, which had the most significant effect on users' continuance intention (M. C. Lee, 2010). Furthermore, this intention can be influenced by perceived quality, perceived usability, confirmation and subjective norms (Roca et al., 2006; M. C. Lee, 2010). Perceived usefulness is also an influence factor of continuance intention (Gao & Bai, 2014). Vatanasombut, Igbaria, Stylianou and Rodgers (2008) mentioned that relationship commitment and trust are central factors for an information system (IS) continuance intention. Meanwhile, anxiety may have a strongly negative effect on continuance intention (Chiu & Wang, 2008), but habit exhibited no strong relationship with continuance intention (Shiau & Luo, 2013).

Many prior researches have defined knowledge sharing. In fact, knowledge sharing is an action about exchange, transferring from one part to another part (Sharratt & Usoro, 2003). J. Lee (2001) came to the same conclusion, he simply defined knowledge sharing as activities of transferring or disseminating knowledge from one person, group or organization to another. Intensive research about knowledge sharing in context has shown that every process of knowledge sharing has two steps (bringing/donating and getting/collecting), and the essence of knowledge sharing is a form of communication (Hooff & Ridder, 2004). C. Tang and Ding (2014) conducted research about professional virtual communities. This article stated that there are six types of knowledge sharing and creation: listening, task performing, information/opinion seeking or providing, recording, evaluating, knowledge contributing and integrating (C. Tang & Ding, 2014). Hence, within the context of previous definitions, continued knowledge sharing is defined by M. C. Lee (2010) as follows:

"Continued knowledge sharing is activities of transferring or disseminating knowledge from one person, group or organization to another with persistent intention".

2.3 Continued knowledge sharing in VACs

Several studies have been proposed to identify the influence factors of continuance intention and knowledge sharing. Their subjects of this research are ISs, online communities or other platforms. However, only a few of the studies are devoted to VACs. Indeed, VACs are one kind of ISs or online communities with special characteristics. Based on different theoretical frameworks and perspectives, prior researchers extracted different dimensions to analyse problems concerning VACs. After listing previous dimensions of continued knowledge sharing in VACs, a summary of previous studies is listed.

2.3.1 Dimensions of continued knowledge sharing

M. C. Lee (2010) synthesized the expectation-confirmation model (ECM), the technology acceptance model (TAM) and the theory of planned behaviour (TPB) to explain people's continuance intention in e-learning. He chose relevant variables of the three theories to build a research model. There are six dimensions in Lee's model: satisfaction, perceived usefulness, attitude, concentration, subjective norm, and perceived behaviour control. In order to build trust and increase stickiness in virtual communities, Wang et al. (2013) developed a research model to explore affecting factors, from the perspectives of processes base, institution base, trust and system.

Trust and satisfaction are classical affecting factors in the research of continuance intention (Chen & Qi, 2015). Chen and Qi (2015) also asserted that trust is an important precondition of members' satisfaction. The sociability and usability factors can be identified as the relevant factors of satisfaction. Moreover, based on the theory of reasoned action, Hassandoust, Logeswaran and Farzaneh Kazerouni (2011) showed that trust is a predictor of continued knowledge sharing. Also, their results showed that attitude towards knowledge sharing and subjective norms are two important dimensions of continuance intention in VACs (2011).

The extended ECM was first applied by Bhattacherjee (2001) who is the earliest researchers to use the ECM in IS (Roca et al., 2006). J. T. E. Tang, Tang and Chiang (2014) proposed using the extended ECM to analyse continuance intention. Four of five dimensions are chosen from the extended ECM (perceived self-efficacy, confirmation, perceived usefulness, satisfaction and continuance intention). They also considered

experiential learning, which is a special factor of blog learning when compared with other researches of virtual communities (J. T. E. Tang et al., 2014).

In addition, the IS success model and the IS post-acceptance model have been merged into M. Zhang, Liu, Yan and Zhang's study (2017). They created a model of continuance intention in three dimensions (information satisfaction, perceived usefulness and interaction satisfaction). Perceived information quality and perceived interaction quality were selected from the IS success model to measure satisfaction and perceived usefulness. By using the self-determination theory and channel expansion theory, Hew, Latifah and Abdul (2016) explored IS impact on behaviours. They found that the following four dimensions may affect behavioural intention: self-determination theory, channel expansion theory, attribute constructs and control variables (Hew et al., 2016). Table 2 is a brief summary of the dimensions of continued knowledge sharing in VACs.

Table 2 Dimensions of continued knowledge sharing in VACs

Author(s)	*Service object*	*Theory of model*	*Dimensions*
M. C. Lee (2010)	E-learning	ECM, TAM and TPB	Satisfaction; perceived usefulness; attitude (perceived ease of use); perceived usefulness; perceived enjoyment; concentration; subjective norm; perceived behavior control.
Wang et al. (2013)	Interest communities	None	Processes base (social interactivity): connectedness, reciprocity; institution base (system interactivity): responsiveness, active control; trust: trust in members, trust in systems; stickiness: member's duration, member's retention.
Chen and Qi (2015)	Academic virtual communities	Social capital theory and TAM	Satisfaction: sociability (structural capital social interaction ties, relational capital, cognitive capital); usability (perceived usefulness, perceived ease of use).
Hassandoust, Logeswaran and Farzaneh Kazerouni (2011)	Academic virtual communities	Theory of reasoned action	Attitude toward knowledge sharing (trust, competition, anticipated reciprocal relationship, willingness to share knowledge); subjective norms (identification, collectivism, organizational culture).
J. T. E. Tang, Tang and Chiang (2014)	Blog learning	Extended-ECM	Perceived self-efficacy, experiential learning, confirmation, perceived usefulness, satisfaction, continuance intention
M. Zhang, Liu, Yan and Zhang (2017)	Virtual learning community	IS success model and ECM	Information, perceived usefulness, interaction satisfaction, perceived information quality, perceived interaction quality, usage experience
Hew, Latifah, and Abdul, (2016)	Cloud-based virtual learning environment	Self-determination theory and channel expansion theory	Self-determination theory, channel expansion theory (perceived media richness), attribute constructs, control variables (specialization, teaching experience, education level)

2.3.2 Summary of previous studies

As most VACs are small groups, little research exists about them. However, considering the above studies, it was found that the SEM method was often used to discover the influence factors involved with VACs. Based on various classic theory frameworks, such

as ECM, TAM, TPB, and the IS success model, most researches combined classical variables with new variables, before creating research models to adapt to the research topics.

The abovementioned studies paid great attention to the users' attitude, satisfaction, subjective norms and so on. Just as the comprehension of *Hamlet* varies from reader to reader, so does the dimension of continuance knowledge sharing from researcher to researcher. Different people have different dimensions. By combining the IS success model and the ECM-IS, this research aims to find a new way to subdivide external variables and explore relationships among the variables.

When examining previous research subjects, it can be seen that most of the articles viewed users as a whole. Thus, this research will focus specifically on young adults. By analysing data from young adults, this research will give a clear correlation between influence factors and explain why young adults have continued intention to share knowledge in VACs.

2.4 Expectation-confirmation theory

After a thorough review of previous papers, it can be seen that there are many researchers who studied continuance intention and knowledge sharing based on various theories. In this thesis, the ECM-IS and the IS success model (also called D&M model), will be used to create a research model. These two theories are frequently used in research.

The ECM (see Figure 2), first used by Oliver(1980), reflects a cognitive theory explaining the continuance intention of repurchasing and reusing. Oliver's theory includes four influence factors: expectations, perceived performance, confirmation of beliefs and satisfaction (Table 3).

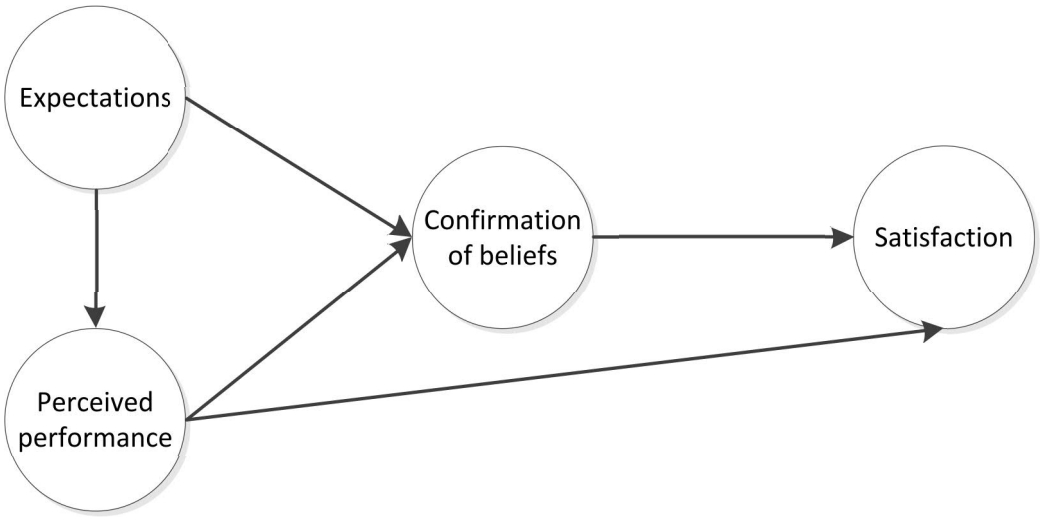

Figure 2 ECM (Oliver, 1980)

Table 3 Oliver's definitions of ECT factors (Oliver, 1980)

Factors	***Definitions***
Expectations	A frame, which makes a comparative judgment, to measure the negative disconfirmation or the positive confirmation.
Perceived performance	A sense of actual performance of a product or service.
Confirmation of beliefs	A belief or one's expectation, before evaluating the probability of outcome and evaluation of outcome.
Satisfaction	A function of expectation level/initial standard and some perceived discrepancy/disconfirmation.

Initially, the ECT was applied to the marketing and psychological aspects, but it can also be used with other aspects, for example, IS and continuance intention. As for research in IS, Bhattacherjee (2001) was one of the earliest researchers to use the ECT in IS (Roca et al., 2006). He did a survey of online banking and built an ECM-IS for continuance (see Figure 3). After an empirical study, he found that users' continuance intention can be influenced by satisfaction, which, in turn, had a positive impact on expectation (Bhattacherjee, 2001). Vatanasombut et al. (2008) also did a study of online banking. They found that trust could be a stronger influence factor of continuance intention when using e-commerce. At the same time, Hong, Thong and Tam (2006) did a survey about information technology (IT) usage behaviours and found that ECT could give us a clear understanding of IT continued usage.

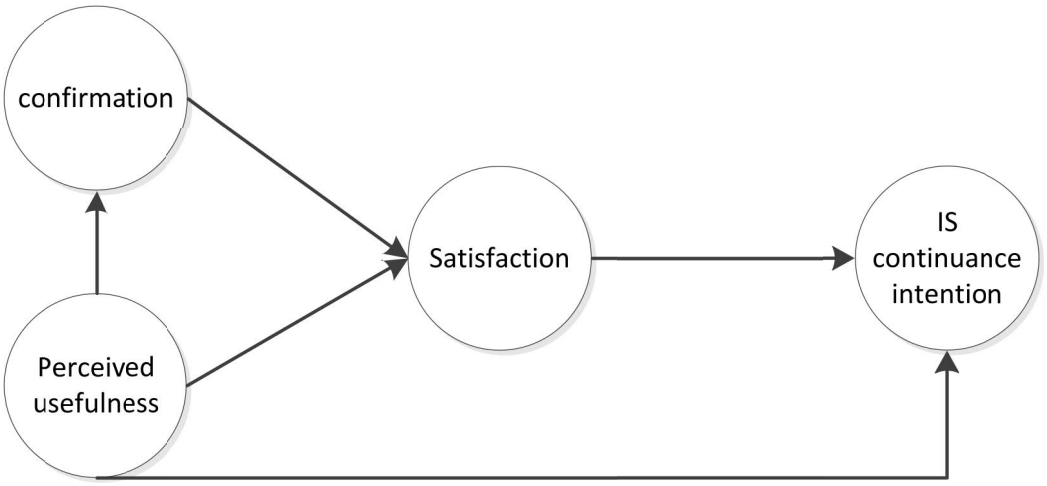

Figure 3 ECM-IS (Bhattacherjee, 2001)

Many researches related to continuance intention like to use ECM-IS. Shiau and Luo (2013) did a survey about the continuance intention of blog users. Combining perceived enjoyment, habit and user involvement, they created a model with ECT. For e-learning, ECM-IS can also be used to explain and predict continuance intention (M. C. Lee, 2010). When the research subject is web-based applications, an extended ECM can be created to identify the influence factors of continuance intention (Vatanasombut et al., 2008). Oghuma, Libaque-Saenz, Wong and Chang (2016) also used ECM-IS to find what drives users to continue to use mobile instead of messaging. For the aforementioned research about continuance intention, researchers would like to use ECM-IS as a part of their model or as the basis for the model. Based on this theory, they added other theories or influence factors in their research, in order to be more consistent with the existing problems.

2.5 IS success model

The IS success model (D&M model) was initially developed by Delone and Mclean in 1992. They conducted a large number of studies about IS success and named a new group of dimensions to measure IS success (Delone & Mclean, 1992). The dimensions are system quality, information quality, use, user satisfaction, individual impact and organizational impact (See Figure 4).

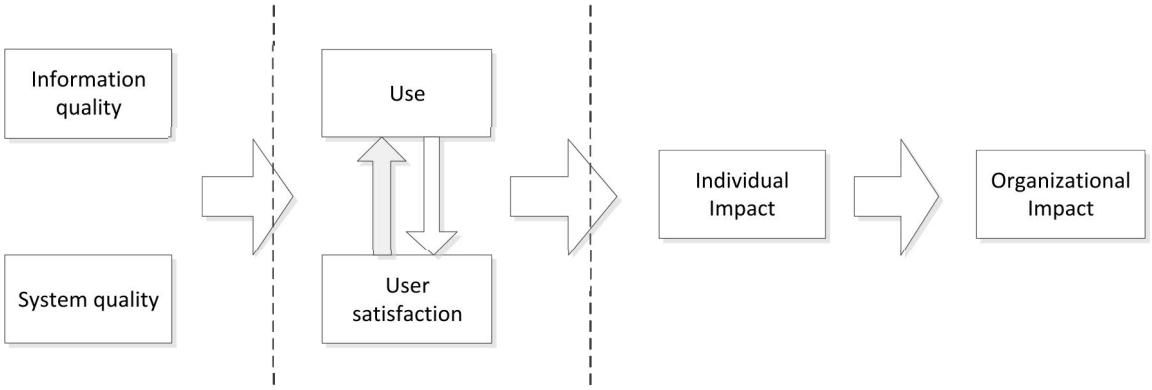

Figure 4 IS success model (Delone & Mclean, 1992)

Ten years after Delone and Mclean introduced the IS success model, they reformulated an extended model of IS success combining it with new experience (Delone & Mclean, 2002). Figure 5 clearly shows that they added service quality as a new dimension, which may influence usage intentions and user satisfaction. Additionally, individual impact and organizational impact were added to the net benefits. However, this model should be further studied in the future, as IS success is a multidimensional and interdependent system (Delone & Mclean, 2003). Definitions of the IS success model factors are shown in Table 4.

Table 4 Definitions of IS success model factors (Delone & Mclean, 1992; Delone & Mclean, 2002)

Factors	***Definitions***
Information quality	The quality of information system output.
System quality	The quality of information processing system itself.
Service quality	The quality of information service.
Usage intentions	Use is a behavior or intention.
User satisfaction	Response to the use of the output.
Net system benefits	The most accurate variable which describes the final success. Benefits for different people in different occasions.

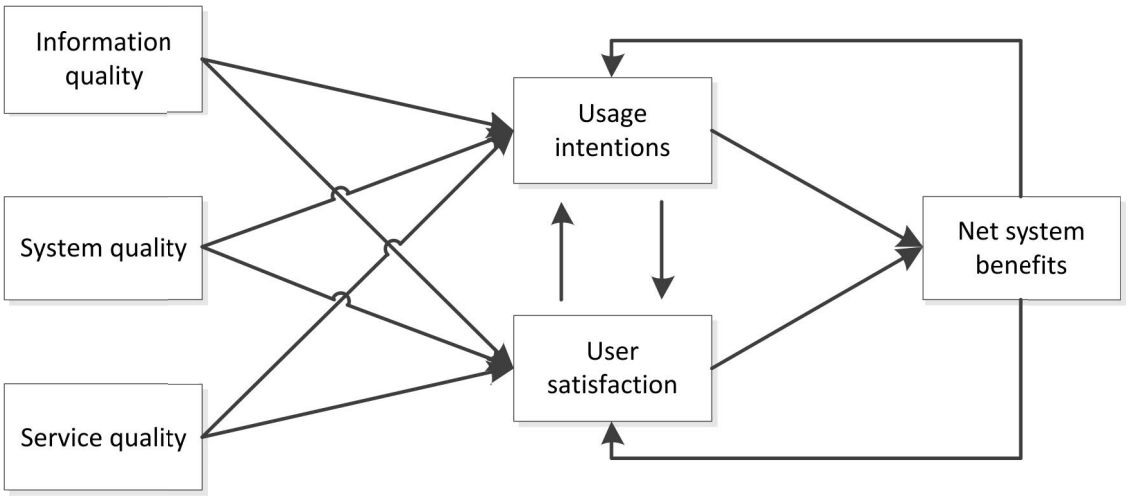

Figure 5 Reformulated IS success model (Delone & Mclean, 2002)

Today, the reformulated IS success model is widely accepted by the public, and many researchers prefer to use the IS success model for their studies. For instance, combined the IS success model with the IS post-adoption model, Zheng, Zhao and Stylianou (2013) studied the impact of information quality and system quality on continuance intention of use. M. Zhang et al. (2017) proposed that information quality and perceived interaction quality can influence continuance intention following the IS success model and IS post-acceptance model. However, in order to prove the IS success model, McGill, Hobbs and Klobas (2003) did a research about user-developed application domains, and they found that some relationships among the variables in the IS success model were not significant. Thus, the IS success model should be further studied in the future.

The ECM-IS model provides a good tool for assessing continuance intention, and the IS success model offers us a good way to extend the external variables in ECM. As the research goal of this thesis is to identify the influence factors of continued knowledge sharing in VACs, this research aims to combine the ECM-IS and the IS success model to create a new research model.

3 RESEARCH MODEL AND HYPOTHESES

This chapter will demonstrate a research model of drivers for continued knowledge sharing in Chinese VACs and will offer hypotheses on the variables. The main part of the research model is going to be built based on the IS success model (Delone & Mclean, 2002) and the ECM-IS (Bhattacherjee, 2001). Secondly, external variables will be extended in three perspectives (people, data, and systems), and each perspective will have one or two control variables. Finally, the hypotheses of the respective variables will be illustrated at the end of the chapter.

3.1 Research model

In previous studies, researchers paid more attention to ISs and knowledge sharing. VACs were simply ignored or assimilated into the ISs. The main topic of this study is to find which factors might influence users' continuous knowledge sharing in VACs. As explained in the prior discussions of the IS success model and ECM-IS, this research attempts to build a new research model, combined two theoretical models with prior empirical researches. The synthesized model is designed to add the currently limited researches about VACs in IS.

In this thesis, the IS success model and ECM-IS provide the basis for the research model. In Bhattacherjee's (2001) article, he proposed that influence factors in ECM-IS were widely used for users' behaviour and perception, such as satisfaction, perceived performance and confirmation. And now the ECT-IS is a classic theory for behaviours studies (Hong et al., 2006; M. C. Lee, 2010; Shiau & Luo, 2013; J. T. E. Tang et al., 2014; H. Zhang, Lu, Gupta, & Gao, 2015). As the topic of this study is related to continuous knowledge sharing behaviours, it can be assumed that satisfaction and confirmation are related to continuance behaviours in VACs.

The variables in the IS success model are a good measurement for external variables. External variables are often extended in order to be more concrete. Based on researches about the IS success model, there are three components (information quality, systems quality and service quality) which may influence users' intention and satisfaction. As my research focuses on drivers for young adults' continued knowledge sharing, it is more concerned with the users and contents in IS. Therefore, academic information quality and quantity are used for measuring the information quality, and the user interface is used for reflecting the systems quality. Furthermore, the users' perspective is an important aspect in IS, so reputation and social relationship trust are added as measurements of the users' perspective. Figure 6 shows the variables and hypotheses.

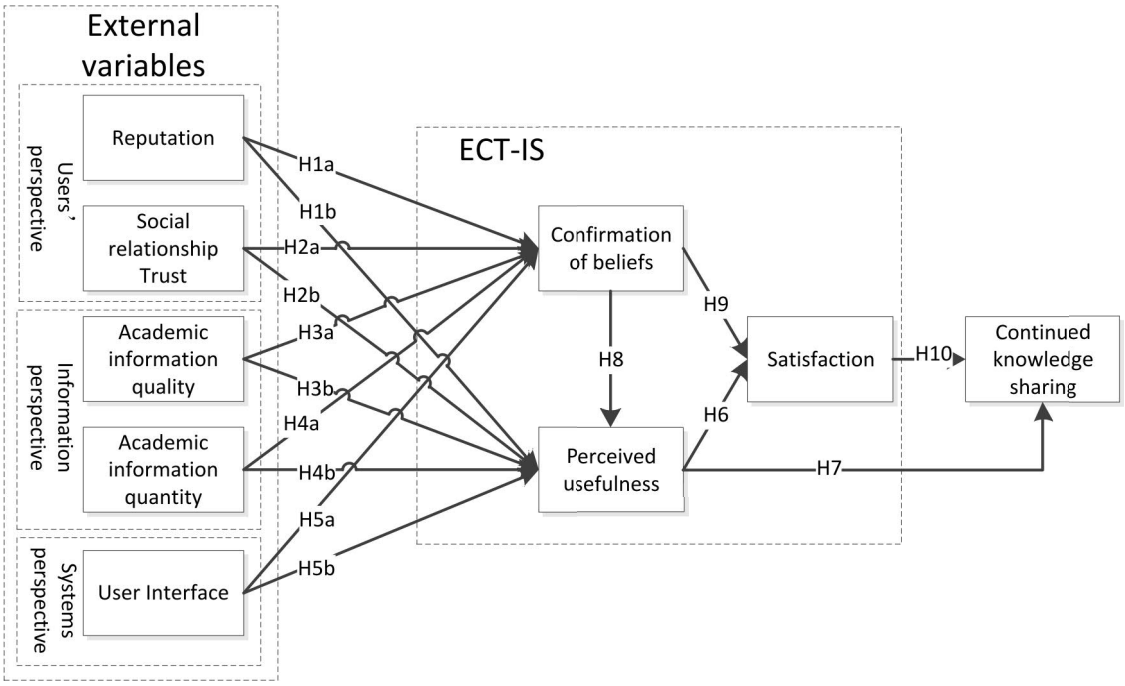

Figure 6 Research model

3.2 Research variables and hypotheses

3.2.1 Reputation

Reputation is always selected to measure people's utilitarian motivation, and this variable is an important asset for virtual communities' users (Liao, To & Hsu, 2013). The definition of reputation is the degree to which a person believes that participation in VACs could improve his or her status or gain respect (Hsu & Lin, 2008; Jin, Zhou, Lee & Cheung, 2013).

Pavlou (2003) conducted research on electronic commerce and found that consumers tend to rely on the reputation of an e-commerce store. Yet, consumers with e-commerce experience may focus on other factors rather than reputation. H. Zhang et al. (2015) illustrated that reputation has a positive influence on consumers' continuance intention. When reputation is connected with ECM, there is a significant proof that reputation is an important motivation for knowledge sharing (Kankanhalli, Tan & Wei, 2005; Jin et al., 2013). People who are in VACs have the same feelings when sharing academic knowledge. If people have earned status and respect from others by prior experience, they will be confident in VACs. Additionally, in today's reputation conscious society, academic reputation is extremely important for a scholar. Good academic reputation is

associated with a scholar's curricular concerns, exclusivity and career preparation (Conard & Conard, 2000).

These arguments proposed a positive effect between reputation and users' confirmation of beliefs in VACs. For example, if a person shared his academic achievements in VACs, they may gain reputation and enhance his status in academic research. Thus, he may feel a sense of confidence and continue to share knowledge in this platform. This is the confirmation of the belief that people may reuse VACs in the future if they gain tangible benefits.

Reputation, as an expectation of obtaining external benefits, refers to a belief that people can benefit from sharing knowledge in a virtual environment (Kankanhalli et al. 2005). People who have enhanced their reputations by sharing knowledge in VACs may feel usefulness. Therefore, it is assumed that perceived usefulness will be positively impacted by reputation. Thus, it is assumed that:

H1a: Reputation positively affects young *adults' confirmation of beliefs in VACs.*

H1b: Reputation positively affects young adults' perceived usefulness in VACs.

3.2.2 Social relationship trust

There are considerable researches on the impact of trust in ISs (Pavlou, 2003; Sharratt et al., 2003; Chiu et al., 2006; Zhang, Fang, Wei & Chen, 2010; Hassandoust et al., 2011; Annadatha, 2012; Hajli, 2014). Many researchers subdivided trust into specific types. For example, Sharratt et al. (2003) divided trust into three types: integrity-based trust, benevolence-based trust and competence-based trust. Wang et al. (2013) did a research about trust in members and trust in systems. From the users' perspective, social relationship trust is a hot topic in virtual communities and also an important factor in communication (Sharratt et al., 2003). In this study, social relationship trust means an expectation that individual members will follow a generally accepted set of values, norms, and principles (Chiu et al., 2006). In other words, everyone in VACs is expected to be trustworthy.

In previous research, trust is a vital factor in volitional behaviours, and knowledge sharing is this kind of behaviour which is hard to evaluate (Chiu et al., 2006). Hashim and Tan (2015) showed that trust is dynamic, and it will show how ongoing relationships have evolved. Also, trust has a direct influence on users' retention, but Pavlou (2003) in his research found that trust has no effect on attitude.

In VACs, academic elites play an important leading role in academic fields. Mayer, Davis and Schoorman (1995) proposed that ability, benevolence and integrity are three factors of trustworthiness. Young adults' who joined in VACs may be affected by academic elites, as they are more trustworthy than the public. Based on previous researches, it can be predicted that social relationship trust may influence young adults'

confirmation of beliefs in VACs, and it also affects the users' perceived usefulness. This leads to the following hypotheses:

H2a: Social relationship trust has a significant positive influence on confirmation of beliefs in VACs.

H2b: Social relationship trust has a significant positive influence on perceived usefulness in VACs.

3.2.3 Academic information quality

The factor of information quality has often been mentioned in previous studies (Roca et al., 2006; I. Y. L. Chen, 2007; Zheng et al., 2013; M. Zhang et al., 2017). In VACs, academic information quality should be given a high level of attention. Prior research defined information quality as users' perception of completeness, format, accuracy and currency (Wixom & Todd, 2005). As for high quality information, it has five characteristics: accuracy, completeness, consistency, uniqueness, and timeliness (Laranjeiro, Soydemir & Bernardino, 2015). Thus, combined with academic information's characteristics, it can be concluded that the definition of academic information quality refers to the users' perception of information completeness, timeliness, academic format, accuracy and preciseness (Wixom & Todd, 2005; Laranjeiro et al., 2015).

At times, information quality has been used as a control variable in research. H. Zhang et al. (2015) argued that information quality should be considered in website quality. Zheng et al. (2013) subdivided quality into information quality and system quality, and they pointed out that information quality was positively related to individual benefits and user satisfaction. When finding the continuance intentions for e-learning, Roca et al. (2006) showed that information quality has a positive influence on confirmation and satisfaction. Also, Wixom and Todd (2005) illustrated that information quality has a significant effect on information satisfaction.

Young adults who want to seek high quality academic information may join in VACs. Thus, academic information quality plays an important role in the success of VACs. After experiencing high-quality information services, young adults may have a stronger motivation to reuse VACs. Thus, it is proposed that:

H3a: Academic information quality of VACs has a positive impact on young adults' confirmation of beliefs in VACs.

H3b: Academic information quality of VACs has a positive impact on young adults' perceived usefulness in VACs.

3.2.4 Academic information quantity

In past researches, information quantity has not been discussed in depth. However, Chiu et al (2006) used average volume of knowledge sharing per month to measure quantity of information. Others have defined information quantity as the volume of knowledge posting and viewing in the virtual community (Chang & Chuang, 2011; Schmitt & Jäschke, 2017). As a result, academic information quantity is defined as the volume of academic information posting and donating per month in VACs.

Compared with information quality, information quantity may have been the main influence factor when virtual communities first began. However, information quality is one of the vital factors for mature virtual communities (Chiu et al., 2006). In other words, if people are not willing to remain members and share knowledge in VACs, the volume of academic information may be directly influenced (Chen & Qi, 2015).

As the goal of this study is to conduct research on young adults' continuous knowledge sharing behaviours in VACs, the subjects will be limited to young adults. The aforementioned researches have shown that information quantity is influenced by trust, reputation, altruism etc. (Chiu et al., 2006; Chang & Chuang, 2011; Schmitt & Jäschke, 2017). In turn, the information quantity may influence young adults' confirmation of beliefs and emotional reactions. Therefore, it is assumed that:

H4a: Academic information quantity of VACs has a positive impact on young adults' confirmation of beliefs in VACs.

H4b: Academic information quantity of VACs has a positive impact on young adults' perceived usefulness in VACs.

3.2.5 User interface

The user interface is a relatively vital influence factor in the perspective of systems (Liu et al., 2010). It can be defined as a system's layout which is arranged and integrated with good figures and clear text (Liu et al., 2010).

Davis, Bagozzi and Warshaw (1989), in their article, proposed that improving the user interface would increase ease of use, as was also argued by Chen and Qi (2015). Hsu and Lin (2008) showed that users' interface may affect people's performance. At the same time, difficult operations may increase users' resistance. Bieber et al. (2002) illustrated that a user interface which is designed with a broad style may meet many potential users' demands. Also, they noted that the users' experience and practices may help the evolution of the interface. As for managers, they should provide a friendly interface to make users feel comfortable. Pleasant experiences, it is believed, will give users a sense of satisfaction (J. T. E. Tang et al., 2014). Thus, it is proposed that:

H5a: User interface of VACs has a positive impact on young adults' confirmation of beliefs in VACs.

H5b: User interface of VACs has a positive impact on young adults' perceived usefulness of VACs.

3.2.6 Perceived usefulness

Perceived usefulness is a factor of ECM-IS, and it is also a factor of TAM, which may influence attitude towards use and behavioural intention (Davis, 1985; Davis et al., 1989). Segars and Grover (1993) showed that usefulness can be subdivided into six indicators: working more quickly, making jobs easier, usefulness, increasing productivity, effectiveness and job performance. Based on Davis's (1989) definition, perceived usefulness in VACs is defined as the extent to which young adults believe that using a VAC will enhance their performance.

Researchers have always connected perceived usefulness with usage intention in ISs (Pavlou, 2003; Sharratt et al., 2003; Hsu & Lin, 2008; Chen & Qi, 2015; Zhang et al., 2017). When analysing problems about continued intention towards ISs, TAM and ECT have often been used and combined (Hong et al., 2006; Roca et al., 2006; M. C. Lee, 2010; Chen & Qi, 2015; Oghuma et al., 2016). In knowledge management systems, perceived usefulness is an important variable for knowledge sharing (Sharratt et al., 2003). M. Zhang et al. (2017) focused on virtual learning community services. In their study, they found that users' intention is determined by perceived usefulness and satisfaction. Chen and Qi (2015) illustrated that perceived usefulness is an antecedent of satisfaction in VACs, and in turn, it will affect intention to reuse. Therefore, young adults who have felt a sense of usefulness will be motivated to use VACs, and this also directly affects people's satisfaction. Therefore, these hypotheses are stated:

H6: Perceived usefulness has a positive impact on young adults' satisfaction in VACs.

H7: Perceived usefulness has a positive impact on young adults' continued knowledge sharing in VACs.

3.2.7 Confirmation of beliefs

Confirmation of beliefs refers to the belief whether one's expectation is confirmed. It is not only related to the probability of outcomes but also to the evaluation of outcomes (Oliver, 1980). Users may develop a means to measure satisfaction based on confirmations of their beliefs and their expectations (Kim, 2012).

Many empirical studies have researched the confirmation of beliefs (Bhattacherjee, 2001; Roca et al., 2006; Kim, 2012; Shiau & Luo, 2013; J. T. E. Tang et al., 2014). Some have shown that confirmation and perceived usefulness have a strong influence on satisfaction (Bhattacherjee, 2001; Roca et al., 2006; Shiau & Luo, 2013). In an e-learning system, perceived usefulness may influence users' confirmation of beliefs (Roca et al., 2006). Confirmation has a causality relationship with pre-expectation, so it may directly influence users' satisfaction (Kim, 2012). In a blog learning system, before starting to use it, users want to obtain expected benefits. So, when their expectation is confirmed, they may feel satisfied (J. T. E. Tang et al., 2014).

In VACs, young adults' expectation is to find some academic information or something related to academia. If their expectation is confirmed, they may have a sense of satisfaction. Therefore, it is hypothesized that:

H8: Confirmation of beliefs has a positive impact on young adults' perceived usefulness in VACs.

H9: Confirmation of beliefs has a positive impact on young adults' satisfaction in VACs.

3.2.8 Satisfaction

Satisfaction is a key determinant variable in research about IS usage intention (Hashim & Tan, 2015). In fact, satisfaction is an individual's feeling. If users' expectation is confirmed, they will have a sense of satisfaction. Thus, this variable refers to the functions of the expectation level and perceptions of confirmation (Oliver, 1980).

Research on continuance intention has indicated that satisfaction is a direct influence factor of continuance behaviours (Hong et al., 2006; He & Wei, 2009; Gao & Bai, 2014). One study on social network services combined the IS success model and the flow theory. In this study, Gao and Bai (2014) found that continuance intention may be influenced by satisfaction, flow and perceived usefulness. He and Wei (2009) focused on knowledge seeking and knowledge sharing, and they found that satisfaction had a direct effect on seeking attitude and contribution attitude. Hong et al. (2006) used the ECM in the IT domain to analyse continued usage behaviours. They claimed that increasing users' satisfaction level will give users a certain belief that will drive them to continually use IT (Hong et al., 2006). Hence, the following hypothesis is derived:

H10: Satisfaction has a positive impact on continued knowledge sharing in VACs.

The summary of variable definitions and hypotheses is shown in Appendix 1.

4 RESEARCH METHODOLOGY

This chapter will describe the research methodology and strategy of this study. Firstly, a brief introduction to SEM and Smart PLS 3.0 will be presented. Secondly, the survey design will be explained, and the scale development will be introduced in the section on the research strategy. Finally, the distribution of the questionnaires and collection of data will be presented.

4.1 Research approach

4.1.1 SEM

SEM can be defined as a general model which is in accordance with many statistical models (Bowen & Guo, 2011). It is highly recommended for social science researchers. SEM software is good for various statistical algorithms, such as path analysis, factor analysis, analysis of covariance, analysis of variance and so on (Bowen & Guo, 2011). It is a powerful technique for researchers who want to analyse complex path models with latent variables (Hox & Bechger, 1998). There are two types of SEM, one is covariance-based SEM (CBSEM), the other is a variance-based method (Vinzi, Chin, Henseler & Wang, 2011). Compared with linear regression models, there are two advantages of SEM. Firstly, SEM provides a better method to analyse path diagrams. Secondly, SEM can analyse many stages of independent and dependent variables (Gefen, Rigdon & Straub, 2011).

Compared with other research methods, PLS has many advantages, especially when the main goal of the analysis is predicted (Sastet, Ringle & Hair, 2017). Hair, Sarstedt, Pieper and Ringle (2012) gave clear reasons to recommend the application of PLS-SEM. It is said that PLS-SEM only needs samples of small size, and it can analyse non-normal data with a complexity model by formative measures (Hair et al., 2012). In addition, this method can complete a reflective outer model assessment and formative outer model assessment at the same time. It is a good way to analyse heterogeneous data structures (Hair et al., 2012). These are the reasons PLS was chosen as the research tool for this study.

For this study, SEM was selected as the research method. Also, by using the PLS method, a research model was constructed to analyse which factors could influence young adults' continued knowledge sharing in Chinese VACs.

4.1.2 SmartPLS 3.0

Currently, there are a lot of software options that can be used to analyse SEM data. For example, AMOS, LISREL and EQS are software for CBSEM, while SmartPLS and PLS-Graph are software for variance-based SEM.

SmartPLS was developed by Ringle, Wende and Wil in 2005, and it is a popular software used for PLS-SEM (Wong, 2013). This software enhances researchers' capabilities and develops their skills by using technology (Joe, Hair, Sarstedt, Matthews & Ringle, 2016), so many scholars prefer to use it as their research tools. Compared with other software, SmartPLS is easy to handle and analyse. The main algorithms are PLS algorithm and bootstrapping. SmartPLS 3.0 is the newest version of SmartPLS. Compared with the previous SmartPLS 2.0 version, the new version added many new functions, such as the consistent PLS algorithm, advanced bootstrapping options, importance-performance matrix analysis and so on.

4.2 Research strategy

To design a reasonable research survey for any study, there are three components that should be highlighted before the survey is conducted: research design, sampling and questionnaire.

For research design, this study employed an online survey to collect data. WenJuanXing – which has the same functions as Webropol – is a very popular website used to design online research questionnaires in China. Because scholars, students and researchers are users of Chinese VACs, there were two ways to distribute questionnaires and to collect data. The first method was to collect respondents by leaving a message in Chinese VACs. This research randomly selected users in Chinese VACs and left a message, as is done in ScienecNet and Xiaomuchong. Another method was to post this questionnaire link to groups of college students and researchers. The questionnaires collected responses via instant messaging software, such as QQ and Wechat.

The quality of the sampling is an essential aspect of a survey. This research selected the individual as the unit of analysis. As it attempted to find reasons why young adults' continued knowledge sharing in Chinese VACs, the respondents, young adults (aged from 18 to 40) who used Chinese VACs, were selected as valid respondents.

The research questionnaire consisted of three parts: introduction of this research, basic information about respondents and scale of items. In the first part of this questionnaire, after a short self-introduction, the definition of VACs was shown to the respondents, which helped them to identify the main topic of the survey. Furthermore, there were some examples of Chinese VACs, such as Researchgate and Xiaomuchong. It gave respondents

a unified definition of VACs to prevent any misunderstandings and to help them to easily understand VACs. In this thesis, VAC means that there is an effective environment of academic knowledge sharing and creation. Groups of people who share the same concern or passion can access up-to-date information via interaction without any physical constraint.

The second part of the questionnaire collected basic information about respondents. Six items were included: gender, age, educational background, experience and frequency of using Chinese VACs. By analysing the basic information of respondents, this research was able to obtain a detailed profile of the respondents and provide an intuitive evaluation of data.

The last part of the questionnaire was the measurement of variables. Because the main goal of this study is to explore influence factors that drive young adults' continued knowledge sharing in Chinese VACs, the data from the questionnaire were of great value. As noted previously, there are many studies in the literatures which are related to this research (see Chapter 2 and Chapter 3). The more cited studies with high relevance were selected as reference sources for this research survey. The mature scales and items in the existing studies served to devise the research questionnaire.

Combining the IS success model and ECM-IS, the variables were extracted and a research model was built. There were eight dependent variables (RE, SRT, QL, QT, UI, CoB, PU, SA) and one independent variable (CKS). Each variable had 2 to 6 measurable items. Most of the measurements adopted in this study were based on the existing research and development scale. In consideration of the characteristics of VACs, some of the measurements were modified in combination with the actual situation. Next, the questionnaire was tested using a 5-point Likert scale, where 1 is 'strongly disagree', 2 is 'disagree', 3 is 'neutral', 4 is 'agree' and 5 is 'strongly agree'.

In total, respondents were required to rate 9 variables with 31 items in total. All the measurement items were classified in accordance with the way of the classification of hypotheses, and then, presented to respondents. Table 5 shows the measurement of items and references. Appendix 2 is the English version of questionnaire, and appendix 3 shows the Chinese version of questionnaire. After all the necessary preparations, the final edition of the questionnaire was distributed.

Table 5 The measurement of items and references

Construct	***Items***	***Reference***
Reputation (RE)	RE1. I earn respect from others by sharing knowledge in VACs.	Liu & Lin, 2014
	RE2. I think sharing knowledge in VACs can improve my status in the academic field.	
	RE3. I thingk sharing knowledge in VACs can improve my reputation in the academic field.	
Social relationship trust (SRT)	SRT1. I have faith in VACs' users and trust them to solve problems.	He & Wei, 2009; Chen & Qi, 2015
	SRT2. I have belief that VACs users have good intent and concern.	
	SRT3. I have belief in VACs users' reliability.	
	SRT4. I trust academic leaders, I will follow them and use VACs.	
Quality of academic information (QL)	QL1. The academic information shared by members in VACs is relevant to the topics.	Chao-Min Chi et al.,2006; Oakleaf, 2009
	QL2. The academic information shared by members in VACs is easy to understand.	
	QL3. The academic information shared by members in VACs is accurate.	
	QL4. The academic information shared by members in VACs is complete.	
	QL5. The academic information shared by members in VACs is reliable.	
	QL6. The academic information shared by members in VACs is timely.	
Quantity of academic information (QT)	QT1. I actively participated in activities in VACs.	Oakleaf, 2009
	QT2. I often contributed academic knowledge to VACs.	
User interface (UI)	UI1. Every feature and function in VACs is easy to understand.	Oghuma, Libaque-Saenz, Wong, & Chang, 2016
	UI2. The VACs are easy to use, even when using it for the first time.	
	UI3. The amount of information displayed in the VACs is appropriate.	
	UI4. VACs can provide accurate information and functions that I need.	
Perceived usefulness (PU)	PU1: Using VACs can improve my performance.	Davis, 1989; Roca et al.2006
	PU2: Using VACs can increase my productivity.	
	PU3: VACs can satisfy my academic research-related needs.	

Table 5 The measurement of items and references (continued)

Construct	***Items***	***Reference***
Satisfaction (SA)	SA1. I am pleased with the experience of using VACs.	Bhattacherjee , 2001; Roca et al.2006
	SA2. I am satisfied with the performance of the VACs service.	
	SA3. My decision to use VACs was a wise one.	
Confirmation of beliefs (CoB)	CoB1. My experience with using VACs was better than what I expected.	Bhattacherjee , 2001; Roca et al.2006
	CoB2. The perceived service level when using VACs was better than what I expected.	
	CoB3. Most of my expectations from using VACs were confirmed.	
Continued knowledge sharing (CKS)	CKS1. I will continue to use VACs to share academic knowledge in the future.	Bhattacherjee , 2001; Roca et al.2006
	CKS2. I will use VACs more than before.	
	CKS3. I will continue to use VACs to share academic knowledge rather than any alternative means, such as traditional academic lectures.	

4.3 Data collection

This study utilized electronic questionnaires to collect responses. On the WenJuanXing questionnaire website, the research questionnaire asked users to complete all the questions before submitting it. Thus, the respondents' answers had no missing values. In total, this research collected 413 questionnaires, but 243 of them were not included in this sample pool. In this invalid sample pool, there were 156 of respondents who did not use Chinese VACs or global VACs, so they had no intuitive feeling related to VACs. Fifty-nine respondents were not from young adults. Twenty-eight of the questionnaires were filled within 1 minute or the respondents simply checked the unified answer, and there were also eliminated. As mentioned above, the advantage of PLS-SEM is that it is good at handling small samples (Wong, 2013). Finally, 170 questionnaires were used as valid sources of data in this research.

Table 6 Demographic information of the respondents

Gender			***Education***		
Categories	***Frequency***	***Percentage (%)***	***Categories***	***Frequency***	***Percentage (%)***
Male	77	45.29	High school or vocational education	2	1.18
Female	93	54.71	Bachelor degree	84	49.41
Total	170	100.00	Master degree	67	39.41
			PhD degree	17	10.00
			Total	170	100.00
Experience			***Frequency/week***		
Categories	***Frequency***	***Percentage (%)***	***Categories***	***Frequency***	***Percentage (%)***
Less than 1 year	18	10.59	Almost no	1	0.59
1-2 years	25	14.71	Less than 1 hour	51	30.00
3-5 years	86	50.59	1-5 hours	71	41.76
More than 5 years	41	24.12	More than 5 hours	47	27.65
Total	170	100.00	Total	170	100.00

As this study aims to investigate users' usage frequency and usage duration of Chinese VACs, the questionnaire included users' experience as a survey item. Table 6 shows the demographic information of the respondents. As for the valid respondents, 98.8% hold bachelor's degrees or above, and nearly 50% hold master's degrees or PhDs. Furthermore, nearly 90% of the valid respondents have used Chinese VACs for more than one year. This means that the respondents have a deep insight into Chinese VACs, and their emotional responses and perceptions of Chinese VACs are valid. In addition, more than half of them (69.41%) used Chinese VACs more than one hour per week. Based on these data, it can be concluded that these respondents are suitable samples for this study.

Table 7 The distribution of usage frequency among different durations of use

Duration of use	***Items***	***Frequency***	***Percentage (%)***
Less than 1 year	Hardly	1	0.59
	Less than 1 hour	13	7.65
	1-5 hours	4	2.35
	More than 5 hours	0	0.00
	Total	18	10.59
1-2 years	Hardly	0	0.00
	Less than 1 hour	8	4.71
	1-5 hours	17	10.00
	More than 5 hours	0	0.00
	Total	25	14.71
3-5 years	Hardly	0	0.00
	Less than 1 hour	26	15.29
	1-5 hours	34	20.00
	More than 5 hours	26	15.29
	Total	86	50.59
More than 5 years	Hardly	0	0.00
	Less than 1 hour	4	2.35
	1-5 hours	16	9.41
	More than 5 hours	21	12.35
	Total	41	24.12

Table 7 shows that young adults who used Chinese VACs less than one year have a lower usage frequency per week. When they have used Chinese VACs for more than five years, they spent longer periods of time in VACs per week. When using duration and usage frequency as measure items, it can be concluded that young adults who have used Chinese VACs for longer durations spend a more time in Chinese VACs per week.

5 EMPIRICAL RESULTS OF RESEARCH MODEL

5.1 Reliability and validity

5.1.1 Construct reliability and validity

Without pre-existing measures of reliability, a new model's reliability and validity should be tested (Mulaik & Millsap, 2000). Reliability of construct means internal consistency of measurement (Chen & Qi, 2015). Also, internal consistency can be evaluated by Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) (Kim, Ferrin & Raghav Rao, 2009). In other words, it refers to the determination of stability, reliability and consistency of the results. CR illustrates the internal consistency of the construct (Shiau & Luo, 2013). Cronbach's alpha refers to the reliability of measures (Tho, 2009), and AVE is the mean of the variance of latent variables.

People generally believe that, when the Cronbach's alpha is greater than 0.7 and the CR is greater than 0.7, then the model can be accepted. Moreover, AVE over 0.5 means that the model has good validity (Cheung & Vogel, 2013). Thus, it can be concluded that all data meet the requirements, and the construct is reliable and valid (see Table 8).

Table 8 Reliability and validity

	Cronbach's Alpha	***Composite Reliability (CR)***	***Average Variance Extracted (AVE)***
Continued knowledge sharing	0.773	0.870	0.691
Social relationship trust	0.801	0.870	0.627
Academic information quality	0.871	0.903	0.610
Academic information quantity	0.711	0.874	0.776
Confirmation of beliefs	0.814	0.890	0.730
Perceived usefulness	0.822	0.894	0.738
Reputation	0.836	0.902	0.754
Satisfaction	0.814	0.890	0.730
User interface	0.844	0.895	0.681

5.1.2 Correlations between the constructs

Fornell and Larcker (1981) suggested that the discriminant validity can be measured by the relationship of size between the square root of the AVE and the variance between the variable and other variables. It mainly shows whether the causal relationship between the correlation coefficients and latent variables is reasonable. The diagonal bold data in Table 9 are taken from the mean square root of the latent variables's AVE. In Table 9, the data for the diagonal values were greater than the other data in their column, which means that this research model has better discriminant degrees. Each variable is independent, and the correlations between them are low.

Table 9 Correlations between the constructs

	CKS	***SRT***	***QL***	***QT***	***CoB***	***PU***	***RE***	***SA***	***UI***
CKS	**0.831**								
SRT	0.646	**0.792**							
QL	0.615	0.471	**0.781**						
QT	0.571	0.476	0.312	**0.881**					
CoB	0.688	0.569	0.563	0.448	**0.855**				
PU	0.568	0.592	0.500	0.397	0.636	**0.859**			
RE	0.667	0.686	0.597	0.472	0.613	0.624	**0.868**		
SA	0.589	0.642	0.346	0.433	0.447	0.423	0.532	**0.854**	
UI	0.527	0.605	0.373	0.374	0.518	0.446	0.482	0.430	**0.825**

5.1.3 Cross-loadings

The cross-loading is mainly aimed at each measurement variables' discriminant validity (Chin, 1998). If factor loadings are far greater than cross-loadings of other variables, and, at the same time, cross-loadings are greater than 0.7, it means that the measurement variables have high quality (Sarstedt, Ringle & Hair, 2017). As shown in Table 10, all factor loadings are greater than cross-loadings and higher than 0.7 for this study. Therefore, it can be concluded that this measurement shows a good discriminant validity.

Table 10 Cross-loadings

	CKS	***CoB***	***PU***	***QL***	***QT***	***RE***	***SA***	***SRT***	***UI***
CKS1	**0.840**	0.604	0.474	0.481	0.517	0.553	0.548	0.543	0.417
CKS2	**0.743**	0.536	0.477	0.506	0.398	0.546	0.424	0.539	0.448
CKS3	**0.903**	0.570	0.466	0.547	0.501	0.562	0.487	0.529	0.449
CoB1	0.631	**0.861**	0.521	0.580	0.423	0.571	0.429	0.534	0.468
CoB2	0.531	**0.796**	0.568	0.376	0.336	0.473	0.283	0.435	0.418
CoB3	0.595	**0.904**	0.548	0.475	0.384	0.521	0.422	0.485	0.441
PU1	0.506	0.544	**0.876**	0.456	0.329	0.576	0.342	0.540	0.410
PU2	0.454	0.490	**0.810**	0.417	0.373	0.488	0.419	0.501	0.327
PU3	0.503	0.604	**0.889**	0.413	0.322	0.543	0.332	0.485	0.409
QL1	0.571	0.440	0.375	**0.839**	0.193	0.467	0.272	0.388	0.270
QL2	0.467	0.431	0.424	**0.702**	0.294	0.441	0.373	0.311	0.272
QL3	0.416	0.459	0.408	**0.831**	0.215	0.451	0.177	0.420	0.337
QL4	0.406	0.436	0.338	**0.709**	0.243	0.420	0.239	0.306	0.275
QL5	0.559	0.489	0.445	**0.819**	0.242	0.533	0.252	0.449	0.362
QL6	0.446	0.365	0.328	**0.777**	0.278	0.476	0.314	0.308	0.206
QT1	0.479	0.390	0.321	0.221	**0.870**	0.415	0.392	0.421	0.303
QT2	0.525	0.399	0.376	0.324	**0.891**	0.416	0.373	0.417	0.354
RE1	0.518	0.525	0.502	0.529	0.402	**0.834**	0.419	0.513	0.402
RE2	0.610	0.505	0.562	0.455	0.410	**0.857**	0.483	0.632	0.424
RE3	0.607	0.565	0.561	0.570	0.418	**0.913**	0.483	0.637	0.429
SA1	0.488	0.372	0.377	0.220	0.420	0.411	**0.844**	0.568	0.366
SA2	0.491	0.350	0.338	0.333	0.335	0.451	**0.824**	0.548	0.348
SA3	0.529	0.420	0.369	0.332	0.357	0.501	**0.894**	0.531	0.386
SRT1	0.494	0.424	0.470	0.351	0.319	0.520	0.516	**0.811**	0.482
SRT2	0.487	0.494	0.482	0.337	0.408	0.495	0.491	**0.753**	0.428
SRT3	0.618	0.515	0.524	0.485	0.456	0.620	0.602	**0.858**	0.591
SRT4	0.423	0.341	0.379	0.295	0.298	0.535	0.395	**0.740**	0.392
UI1	0.374	0.393	0.322	0.305	0.301	0.300	0.336	0.474	**0.776**
UI2	0.447	0.381	0.345	0.217	0.270	0.442	0.371	0.509	**0.803**
UI3	0.378	0.409	0.294	0.277	0.297	0.341	0.297	0.437	**0.818**
UI4	0.519	0.509	0.478	0.404	0.357	0.485	0.405	0.566	**0.899**

5.2 Empirical results of the research model

In SmatPLS 3.0, the bootstrapping algorithm is a procedure which tests whether the relationships among variables are significant (Sarstedt et al., 2017). It will extract a large volume of samples (normally 5000) from the origin data using the repetition method. And then, each subsample will be estimated and formed a large number of estimations for each parameter (Sarstedt et al., 2017).

The *t*-value is a test of the distinction of a single variable. The value of *t* can be calculated by the *p*-value. When the absolute value of *t* is greater than the critical value,

this indicates that the variable is significant. Otherwise, the relationship among variables is not considered significant. When the value of *t* is greater than 3.29, the relationship among variables is extremely significant. When the value is from 2.58 to 3.29, the relationship is relatively significant. When the value is from 1.96 and 2.58, the variable is significant. But when the *t*-value is lower than 1.96, it means that the variable is not significant.

In Appendix 4, each measured indicator's standard deviation (SD) is less than 0.1.The algorithm of the *t*-value test is the original sample divided by the SD, and each measured indicator's *t*-value is greater than 9. This shows that the measured indicators are related to the corresponding latent variables.

Table 11 Test results of the hypotheses

Hypotheses	***Path***	***Structural coefficient***	***t-Value***	***Results***
H1a	RE -> CoB	0.221^{*}	2.135	Support
H1b	RE -> PU	0.228^{*}	2.173	Support
H2a	SRT -> CoB	0.111^{ns}	1.218	Not support
H2b	SRT > PU	0.198^{*}	2.042	Support
H3a	QL -> CoB	0.264^{**}	3.094	Support
H3b	QL -> PU	0.076^{ns}	0.76	Not support
H4a	QT -> CoB	0.136^{*}	2.183	Support
H4b	QT -> PU	0.021^{ns}	0.338	Not support
H5a	UI -> CoB	0.196^{*}	2.553	Support
H5b	UI -> PU	0.010^{ns}	0.157	Not support
H6	PU -> SA	0.223^{*}	2.165	Support
H7	PU -> CKS	0.389^{***}	5.094	Support
H8	CoB -> PU	0.326^{**}	2.807	Support
H9	CoB -> SA	0.298^{**}	3.016	Support
H10	SA -> CKS	0.424^{***}	5.475	Support
P.S.： *p < 0.05; **p < 0.01; ***P < 0.001; ns: not significant				

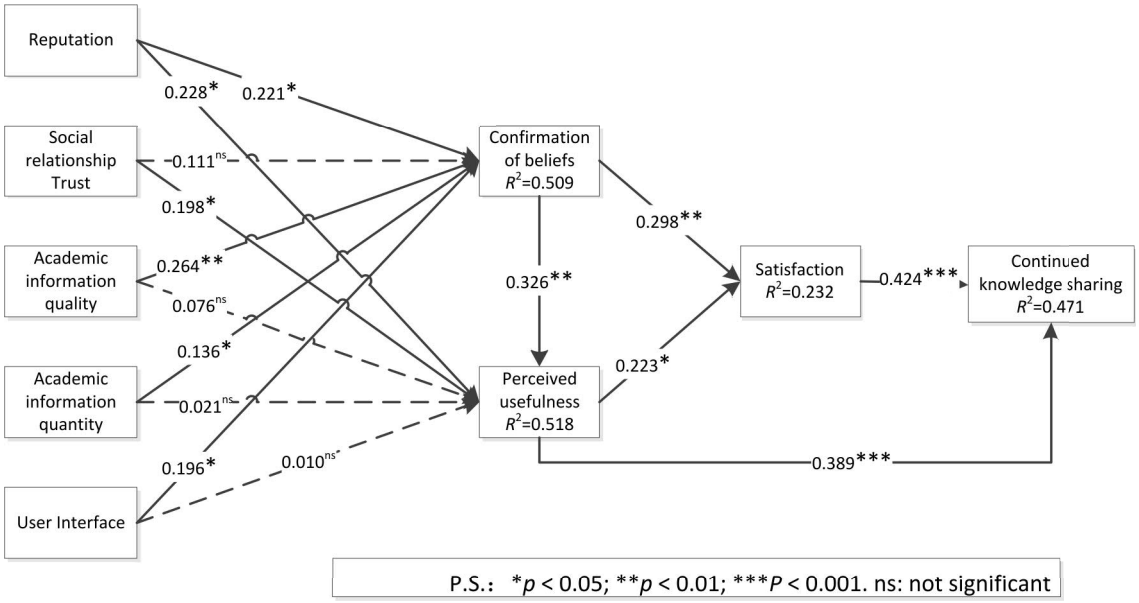

Figure 7 Structural analysis of the research model

Table 11 and Figure 7 show the test results for the hypotheses about VACs, including path coefficients, *t*-values and level of significance. For H1a to H5a, these five hypotheses are related to the relationship between external variables and confirmation of beliefs. The test results show that reputation (β = 0.221, t = 2.135, $p < 0.05$), academic information quality (β = 0.264, t = 3.094, $p < 0.01$), academic information quantity (β = 0.136, t = 2.183, $p < 0.05$) and user interface (β = 0.196, t = 2.553, $p < 0.05$) have significant effects on confirmation of beliefs. But social relationship trust (β = 0.111, t = 1.218, $p > 0.05$) is not significant to confirmation of beliefs.

However, when considering hypotheses H1b to H5b, it can be seen that only two hypotheses are significant. Reputation (β = 0.228, t = 2.173, $p < 0.05$) and social relationship trust (β = 0.198, t = 2.042, $p < 0.05$) show positive relationships with perceived usefulness. This means that H1b and H2b are supported, but H3b (β = 0.076, t = 0.760, $p > 0.05$), H4b (β = 0.021, t = 0.338, $p > 0.05$) and H5b (β = 0.010, t = 0.157, $p > 0.05$) are not significant.

Furthermore, perceived usefulness (β = 0.389, t = 5.094, $p < 0.001$) has a great effect on continued knowledge sharing. Perceived usefulness (β = 0.223, t = 2.165, $p < 0.05$) is also significant on satisfaction.

Similar to the prior research results, H8 and H9 are also supported. Confirmation of beliefs shows a strong influence on perceived usefulness (β = 0.326, t = 2.807, $p < 0.01$) and satisfaction (β = 0.298, t = 3.016, $p < 0.01$), respectively. Also, then, the factor of satisfaction (β = 0.424, t = 5.475, $p < 0.001$) significantly and positively influences continued knowledge sharing.

The square of R is the coefficient of determination. As is shown in Figure 7, reputation, social relationship, academic information quality, academic information quantity and user

interface can explain 50.9% of the variance of confirmation of beliefs, and those variables can also explain 51.8% the variance of perceived usefulness. But, perceived usefulness and confirmation of beliefs have a low percentage of variance for interpreting satisfaction, at only 23.2%. Ultimately, the proposed model explains 47.1% of the variance of continued knowledge sharing in VACs.

6 DISCUSSION AND CONCLUSION

This chapter will further discuss the empirical test results of this study and illustrate them in terms of three aspects. Firstly, by comparing the results with prior researches, the causal relationship of these hypotheses will be further examined. Then, the theoretical and practical implications of this thesis are presented. Finally, based on the shortcoming of this study, the limitations of this research will be discussed.

6.1 Key findings

This section will address the answer to the research question: what drives young adults' continued knowledge sharing in Chinese VACs? It was found that most of the hypotheses were significant and strongly supported our research model. Through this research, it can be concluded that satisfaction is the most important influence factor for young adults' continued knowledge sharing. The antecedents of satisfaction are confirmation of beliefs and perceived usefulness. At the same time, perceived usefulness has a direct significant influence on continued knowledge sharing in the main body of the research model. Reputation, academic information quality, academic information quantity and user interfaces are four drivers for young adults' confirmation of beliefs. Moreover, reputation and social relationship trust are two factors that influence young adults' perceived usefulness. The details of three findings are as follows:

Firstly, the main body of the research model based on the ECM-IS was supported. It was determined that satisfaction (β = 0.424, t = 5.475, p < 0.01) highly and positively influences young adults' continued knowledge sharing in VACs. As expected, increased satisfaction will lead to increased intention to use (Delone & Mclean, 2002). Satisfaction is the most important variable that drives young adults' continued knowledge sharing in Chinese VACs. Furthermore, confirmation of beliefs and perceived usefulness were assumed to be antecedents of satisfaction in Chinese VACs. They all had strong influences on satisfaction. The results suggest that both hypotheses have been implemented, which were also supported by earlier research on continued knowledge sharing (Bhattacherjee, 2001; Roca et al., 2006; Shiau & Luo, 2013). In addition, perceived usefulness (β = 0.389, t = 5.094, p < 0.001) had a direct influence on young adults' continued knowledge sharing, which motivated users to share knowledge in VACs (Sharratt et al., 2003). Overall, the higher level of perceived usefulness and confirmation of beliefs, the more satisfying Chinese VACs appear to be, and this has motivated young adults' continued knowledge sharing.

Secondly, as for the determinants of confirmation of beliefs, the results in this research showed that reputation, academic information quality, academic information quantity and

user interface have positive effects on confirmation of beliefs. Reputation ($\beta = 0.221$, $t = 2.135$, $p < 0.05$) is a significant factor of confirmation of beliefs. This finding is consistent with prior research (Jin et al., 2013). Jin et al. (2013) indicated that reputation enhancement had a positive influence on confirmation, and our research results confirm this. Academic information quality and academic information quantity are factors related to users' perspectives concerning information. Indeed, if the quantity of information is enough for users, and if the information quality is valid, then young adults will have a sense of confirmation. Also, user interface ($\beta = 0.196$, $t = 2.553$, $p < 0.05$) has significant effects on confirmation of beliefs. Although few researchers have explored the correlation between the user interface and confirmation of beliefs, the data in this study can prove that user interface is an influence factor of confirmation of beliefs.

As for social relationship trust ($\beta = 0.111$, $t = 1.218$, $p > 0.05$), it is not an influence factor for confirmation of beliefs. This finding supports the previous research about relationships in online environments (Kim et al., 2009; Kim, 2012). Kim et al. (2009) did not consider trust as an influence factor for confirmation. And, in 2012, he built a research model to reverify this result. Finally, he concluded that trust is an indirect effect for confirmation (Kim, 2012). Thus, it is reasonable to conclude that there is no positive relationship between social relationship trust and confirmation of beliefs directly.

Thirdly, the result of this research showed that reputation and social relationship trust were two influence factors of perceived usefulness. Social relationship trust ($\beta = 0.198$, $t = 2.042$, $p < 0.05$) has been generally regarded as an influence factor of perceived usefulness (Pavlou, 2003; Kim, 2012). Pavlou (2003) showed that trust directly influenced perceived usefulness, which is similar to our findings. Kim (2012) may not have found the direct influence, but he illustrated that trust can positively influence satisfaction, and then satisfaction can positively influence perceived usefulness. This study also found that reputation ($\beta = 0.228$, $t = 2.173$, $p < 0.05$) is a significant factor for perceived usefulness. This result is consistent with the findings of a prior study. Madden and Smith (2010) have shown that young adults are the most active on online platforms and prefer to manage their reputation when compared with older users. This is the main reason why reputation positively influences variables for young adults' perceived usefulness.

However, in contrast to expectations, three variables are not significant for perceived usefulness. They are academic information quality, academic information quantity and user interface. Gao and Bai (2014) divided quality into system quality and information quality, which are antecedents of perceived usefulness. Zhang et al. (2017) also illustrated that information quality can directly affect perceived usefulness. In this study, the results for academic information quality ($\beta = 0.076$, $t = 0.760$, $p > 0.05$), quantity ($\beta = 0.021$, $t = 0.338$, $p > 0.05$) and user interface ($\beta = 0.010$, $t = 0.157$, $p > 0.05$) towards perceived usefulness are not inconsistent with expectations. Some possible reasons for theses results are shown below. Firstly, academic information, papers and theses have copyrights, so

they are not open to all the public. If people publish an article without the authors' permission, they are legally responsible. Secondly, as for user interface, today, VACs in China have many function boards, and they are lengthy and jumbled. For example, ScienceNet not only focuses on sharing academic information, but also has many advertisement boards and unnecessary information. XiaoMuChong has many zombie boards on which no one wants to share knowledge. Thus, small quantities and low quality of academic information in VACs may have no significant effect on perceived usefulness. Thus, the results that user interface do not positively influence perceived usefulness could be explained.

6.2 Theoretical and practice implications

6.2.1 Theoretical implications

This study provides a good explanation of which factors have a correlation with young adults' continued knowledge sharing. As for theoretical implications, this study combined ECM-IS with IS success model. By narrowing the research subject to young adults, it was found that satisfaction is the main influence factor for continued knowledge sharing.

This research adopted the ECM-IS as the theoretical basis for the main research model. In accordance with IS success model, external variables were extended in three perspectives (people, data, and systems). Reputation, social relationship trust, academic information quality, academic information quantity and user interface were added as control variables. Combining two theoretical models, this research built a new research model. It determined that reputation, academic information quality, academic information quantity and user interface are drivers for confirmation of beliefs. Moreover, reputation and social relationship are found to be drivers for perceived usefulness. Furthermore, the results indicated that the attributions of confirmation of beliefs and perceived usefulness exert an influence on satisfaction, and then, influence continued knowledge sharing.

6.2.2 Practice implications

This research found that satisfaction is the most significant and direct influence factor for young adults' continued behaviours. If VAC managers want to motivate young adults to continue their use of VACs and share knowledge, the most effective way is to increase young adults' satisfaction and meet their demands. However, based on the results, some important implications for practice should be mentioned.

Firstly, the results show that reputation has a significant influence on confirmation of beliefs and perceived usefulness. A reasonable reputation mechanism is needed for mature VACs. If users actively interact with others or continue sharing academic knowledge in VACs, they will get a higher virtual reputation or even virtual money. More than that, people who have similar interests can receive a personalized recommendation. This can also increase their reputation in real life. People often trust others who have a high visibility or great reputations. Not only young adults but also the public will follow leaders' blogs or BBSs, and this can increase the number of VAC users.

Secondly, academic information quality and quantity positively affect young adults' confirmation of beliefs in VACs. This emphasizes the importance of information quality and information quantity. The basic functions of VACs are to share and seek academic information. By increasing academic information quality and monitoring quantity, false or outdated information can be deleted, and the emerging academic information or conference information can be highlighted in the user interface.

Thirdly, user interface shows a positive impact on young adults' confirmation of beliefs in VACs. Thus, simplifying user interfaces and cutting down on redundant functions would be helpful in improving VAC user interfaces. Furthermore, if there are some complex operations, VAC managers can add a brief video to introduce these functions.

6.2.3 Limitations and further suggestions

There are three limitations of this study. Firstly, this research regards Chinese VACs and younger adults as the research subjects, but it should also consider whether the results are suitable for all VACs and all target populations. Secondly, the data were collected randomly without limitation. It should be considered whether other factors, such as vocations or positions, have influences on the results. Thirdly, because the practical implications are not tested or assessed, this study cannot determine whether the expectations and goals were completely achieved.

Since this is a confirmatory factor analysis, our research can only test the variables which are included in this research model. However, further researches on this topic can be based on this study's results in order to find ways to improve Chinese VAC services for young adults in the future. Moreover, other influence factors can be considered for this topic of continued knowledge sharing in VACs.

REFERENCES

Ackoff, R. L. (1989). From data to wisdom. *Journal of Applied Systems Analysis*, *16*(1), 3–9.

Annadatha, J. V. (2012). *Sociocultural factors and knowledge sharing behaviors in virtual project teams* (Doctoral dissertation*)*. Robert Morries University, Pittsburgh, PA, USA.

Bhattacherjee, A. (2001). Understanding information systems continuance: An expectation-confirmation model. *MIS Quarterly*, *25*(3), 351–370.

Bieber, M., Engelbart, D., Furuta, R., Hiltz, S. R., Noll, J., Preece, J., … Van de Walle, B. (2002). Toward virtual community knowledge evolution. *Journal of Management Information Systems*, *18*(4), 11–35.

Blanchard, A. L., & Markus, M. L. (2002). Sense of virtual community-maintaining the experience of belonging. In: *Proceedings of the 35th Hawaii International Conference on System Sciences* (pp. 3566–3575).

Cercone, K. (2008). Characteristics of adult learners with implications for online learning design. *Association for the Advancement of Computing In Education Journal*, *16*(2), 137–159.

Chang, H. H., & Chuang, S. S. (2011). Social capital and individual motivations on knowledge sharing: Participant involvement as a moderator. *Information and Management*, *48*(1), 9–18.

Chen, C. (2006). CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature. *Communications in Information Literacy*, *57*(3), 359–377.

Chen, I. Y. L. (2007). The factors influencing members' continuance intentions in professional virtual communities—a longitudinal study. *Journal of Information Science*, *33*(4), 451–467.

Chen, M., & Qi, X. (2015). Members' satisfaction and continuance intention: A socio-technical perspective. *Industrial Management & Data Systems*, *115*(6), 1132–1150.

Cheung, R., & Vogel, D. (2013). Predicting user acceptance of collaborative technologies: An extension of the technology acceptance model for e-learning. *Computers and Education*, *63*, 160–175.

Chin, W. W. (1998). The partial least squares approach to structural equation modeling. *Modern Methods for Business Research, 295(2)*, 295–336.

Chiu, C. M., Hsu, M. H., & Wang, E. T. G. (2006). Understanding knowledge sharing in virtual communities: An integration of social capital and social cognitive theories. *Decision Support Systems*, *42*(3), 1872–1888.

Chiu, C. M., & Wang, E. T. G. (2008). Understanding Web-based learning continuance intention: The role of subjective task value. *Information and Management*, *45*(3), 194–201.

Civi, E. (2000). Knowledge management as a competitive asset: A review. *Marketing Intelligence & Planning*, *18*(4), 166–174.

Conard, M. J., & Conard, M. A. (2000). An analysis of academic reputation as perceived by consumers of higher education. *Journal of Marketing for Higher Education*, *9*(4), 69–80.

Cooke, R. W. I. (2004). Health, lifestyle, and quality of life for young adults born very preterm. *Archives of Disease in Childhood*, *89*(3), 201–206.

Davenport, T. H., & Prusak, L. (1998). *Working knowledge: How organizations manage what they know.* Boston: Harvard Business Press.

Davis, F. D. (1985). *A technology acceptance model for empirically testing new end-user information systems: Theory and results*. (Doctoral dissertation) Massachusetts Institute of Technology, Cambridge, MA, USA..

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319–340.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology : A comparison of two theoretical models, *35*(8), 982–1003.

Delone, W. H., & Mclean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research*, *3*(1), 60–95.

Delone, W. H., & Mclean, E. R. (2002). Information systems success revisited. In: *Proceeding of the 35th Annual Hawaii International Conference on system sciences* (pp. 2966–2976).

Delone, W. H., & Mclean, E. R. (2003). The Delone and Mclean model of information systems success: A ten-year update. *Journal of Management Information Systems*, 19(4), 9–30.

Demarest, M. (1997). Understanding knowledge management. *Long Range Planning*, *30*(3), 321–384.

Elliot, L. B,, Rubin, B., DeCaro, J. J., William Clymer, E., Earp, K., & Fish, M. D. (2013). Creating a virtual academic community for STEM students. *Journal of Applied Research in Higher Education*, *5*(2), 173–188.

Esposito Vinzi, V., Chin, W. W., Henseler, J., & Wang, H. (2010). *Handbook of partial least squares: Concepts, methods and applications.* Heidelberg, Dordrecht, London, New York: Springer.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *XVIII*, 39–50.

Gao, L., & Bai, X. (2014). An empirical study on continuance intention of mobile social networking services. *Asia Pacific Journal of Marketing and Logistics*, *26*(2), 168–189.

Gefen, Rigdon, & Straub. (2011). An update and extension to SEM guidelines for administrative and social science research. *MIS Quarterly*, *35*(2), iii–xiv.

Giddens, J., Hrabe, D., Carlson-Sabelli, L., Fogg, L., & North, S. (2012). The impact of a virtual community on student engagement and academic performance among baccalaureate nursing students. *Journal of Professional Nursing*, *28*(5), 284–290.

Hagel, J. (1999). Net gain: Expanding markets through virtual communities. *Journal of Interactive Marketing*, *13*(1), 55–65.

Hair, Jr., J. F., Sarstedt, M., Matthews, L. M., & Ringle, C. M. (2016). Identifying and treating unobserved heterogeneity with FIMIX-PLS: Part I – Method. *European Business Review*, 28(1), 63–76.

Hair, J. F., Sarstedt, M., Pieper, T. M., & Ringle, C. M. (2012). The use of partial least squares structural equation modeling in strategic management research: A review of past practices and recommendations for future applications. *Long Range Planning*, *45*(5–6), 320–340.

Hajli, M. N. (2014). A study of the impact of social media on consumers. *International Journal of Market Research*, *56*(3), 387–404.

Hashim, K. F., & Tan, F. B. (2015). The mediating role of trust and commitment on members' continuous knowledge sharing intention: A commitment-trust theory perspective. *International Journal of Information Management*, *35*(2), 145–151.

Hassandoust, F., Logeswaran, R., & Farzaneh Kazerouni, M. (2011). Behavioral factors influencing virtual knowledge sharing: Teory of reasoned action. *Journal of Applied Research in Higher Education*, *3*(2), 116–134.

He, W., & Wei, K. K. (2009). What drives continued knowledge sharing? An investigation of knowledge-contribution and -seeking beliefs. *Decision Support Systems*, *46*(4), 826–838.

Hew, T., Latifah, S., & Abdul, S. (2016). Predicting the acceptance of cloud-based virtual learning environment : The roles of self determination and channel expansion theory. *Telematics and Informatics*, *33*, 990–1013.

Hill, W., Stead, L., Rosenstein, M., & Furnas, G. (1995). Recommending and evaluating choices in a virtual community of use. In: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 194–201).

Hong, S. J., Thong, J. Y. L., & Tam, K. Y. (2006). Understanding continued information technology usage behavior: A comparison of three models in the context of mobile internet. *Decision Support Systems*, *42*(3), 1819–1834.

Hooff, B. Van Den, & De Ridder, J. A. (2004). Knowledge sharing in context: The influence of organizational commitment, communication climate and CMC use on knowledge sharing. *Journal of Knowledge Management*, *8*(6), 117–130.

Hope Cheong, P. (2008). The young and techless? Investigating internet use and problem-solving behaviors of young adults in Singapore. *New Media and Society*, *10*(5), 771–791.

Hox, J. J., & Bechger, T. M. (1998). An introduction to structural equation modeling. *Science Family Review*, 11, 354-373.

Hsu, C. L., & Lin, J. C. C. (2008). Acceptance of blog usage: The roles of technology acceptance, social influence and knowledge sharing motivation. *Information and Management*, *45*(1), 65–74.

Jamali, H. R. (2017). Copyright compliance and infringement in ResearchGate full-text journal articles. *Scientometrics*, *112*(1), 241–254.

Jennex, M. E., & Olfman, L. (2004). Assessing knowledge management success/effectiveness models. In: *Proceedings of the 37th Annual Hawaii International Conference on System Sciences* (pp. 1–10).

Jennex, M. E., Smolnik, S., & Croasdell, D. T. (2009). Towards a consensus knowledge management success definition. *Vine*, *39*(2), 174–188.

Jie, X., & Zhengang, Z. (2010). Research on the relationship between knowledge management infrastructure, knowledge sharing and knowledge management performance. In *Proceedings of the 2010 International Conference on Management and Service Science (MASS)*.

Jin, X., Zhou, Z., Lee, M. K. O., & Cheung, C. M. K. (2013). Why users keep answering questions in online question answering communities : A theoretical and empirical investigation. *International Journal of Information Management*, *33*(1), 93–104.

Kankanhalli, A., Tan, B. C., & Wei, K. K. (2005). Contributing knowledge to electronic knowledge repositories: An empirical investigation. *MIS Quarterly*, *29*(1), 113–143.

Kim, D. J. (2012). An investigation of the effect of online consumer trust on expectation, satisfaction, and post-expectation. *Information Systems and E-Business Management*, *10*(2), 219–240.

Kim, D. J., Ferrin, D. L., & Raghav Rao, H. (2009). Trust and satisfaction, two stepping stones for successful e-commerce relationships: A longitudinal exploration. *Information Systems Research*, *20*(2), 237–257.

Laranjeiro, N., Soydemir, S. N., & Bernardino, J. (2015). A survey on data quality: Classifying poor data. In: *Proceedings of the IEEE 21st Pacific Rim International Symposium on Dependable Computing (PP. 179-188)*.

Lee, J. (2001). The impact of knowledge sharing , organizational capability and partnership quality on IS outsourcing success. *Information & Management*, *38*(5), 323–335.

Lee, M. C. (2010). Explaining and predicting users' continuance intention toward e-learning: An extension of the expectation-confirmation model. *Computers and Education*, *54*(2), 506–516.

Liao, C., To, P.-L., & Hsu, F.-C. (2013). Exploring knowledge sharing in virtual communities. *Online Information Review*, *37*(6), 891–909.

Liu, I. F., Chen, M. C., Sun, Y. S., Wible, D., & Kuo, C. H. (2010). Extending the TAM model to explore the factors that affect intention to use an online learning community. *Computers and Education*, *54*(2), 600–610.

Martín-Martín, A., Orduna-Malea, E., Ayllón, J. M., & Delgado López-Cózar, E. (2016). The counting house: Measuring those who count. Presence of bibliometrics, scientometrics, informetrics, webometrics and altmetrics in the Google Scholar citations, Researcherid, ResearchGate, Mendeley & Twitter. <https://arxiv.org/abs/1602.02412>, retrieved 06.06.2018

Mayer, R. C., Davis, J. H., & Schoorman, D. F. (1995). An integrative model of organizational trust. *Academy of Management Review*, *20*(3), 709–734.

McGill, T., Hobbs, V., & Klobas, J. (2003). User-developed applications and information systems success: A test of Delone and Mclean's model. *Information Resources Management Journal*, *16*(1), 24–45.

Moore, T. D., & Serva, M. A. (2007). Understanding member motivation for contributing to different types of virtual communities: A proposed framework. In: *Proceedings of the 2007 ACM SIGMIS CPR conference on Computer personnel research: The global information technology workforce* (pp. 153–158).

Mulaik, S., & Millsap, R. (2000). Using structural equation modeling to test for differential reliability and validity : An empirical demonstration. *Structural Equation Modeling*, *7*(1), 36–73.

Mulkey, L. M., Dougan, W. L., & Steelman., L. C. (2005). Electronic governance : Locals and cosmopolitans "in and as" a virtual academic community. *International Journal of Public Administration*, *28*(7–8), 703–721.

Nistor, N., Baltes, B., Dascălu, M., Mihăilă, D., Smeaton, G., & Trăuşan-Matu, Ş. (2014). Participation in virtual academic communities of practice under the influence of technology acceptance and community factors. A learning analytics application. *Computers in Human Behavior*, *34*, 339–344.

Oghuma, A. P., Libaque-Saenz, C. F., Wong, S. F., & Chang, Y. (2016). An expectation-confirmation model of continuance intention to use mobile instant messaging. *Telematics and Informatics*, *33*(1), 34–47.

Oliver, R. L. (1980). A cognitive model of the antecedents and consequences of satisfaction decisions. *Journal of Marketing Research*, *17*(4), 460–470.

Organisation for Economic Co-operation and Development. (2001), Governance in the 21st Century, OECD Publishing, <https://doi.org/10.1787/9789264189362-en.> , retrieved 08.06.2018

Parikh, M. (2001). Knowledge management framework for high-tech research and development. *Engineering Management Journal*, *13*(3), 27–34.

Pavlou, P. A. (2003). Consumer acceptance of electronic commerce: Integrating trust and risk with the technology acceptance model. *International Journal of Electronic Commerce*, *7*(3), 69–103.

Pelling, E. L., & White, K. M. (2009). The theory of planned behaviour applied to young people's use of social networking websites. *CyberPsychology & Behavior*, *12*(6), 755–759.

Quintas, P., Lefrere, P., & Jones, G. (1997). Knowledge management : A strategic agenda. *Long Range Planning*, *30*(3), 385–391.

Roca, J. C., Chiu, C. M., & Martinez, F. J. (2006). Understanding e-learning continuance intention: An extension of the technology acceptance model. *International Journal of Human Computer Studies*, *64*(8), 683–696.

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2017). Partial least squares structural equation modeling. *In Handbook of market research* (pp. 1-40). Springer International Publishing.

Schmitt, M., & Jäschke, R. (2017). What do computer scientists tweet? Analyzing the link-sharing practice on Twitter. *PLoS ONE*, *12*(6), 1–29.

Segars, A. H., & Grover, V. (1993). Re-examining perceived ease of use and usefulness: A confirmatory factor analysis. *MIS Quarterly*, *17*(4), 517–525.

Serban, A. M., & Luan, J. (2002). Overview of knowledge management. *New Directions for Institutional Research*, *113*(113), 5–16.

Sharratt, M., & Usoro, A., (2003). Understanding knowledge-sharing in online communities of practice. *Electronic Journal on Knowledge Management*, *1*(2), 187–196.

Shaw, M. J., Subramaniam, C., Tan, G. W., & Welge, M. E. (2001). Knowledge management and data mining for marketing. *Decision Support Systems*, *31*(1), 127–137.

Shiau, W. L., & Luo, M. M. (2013). Continuance intention of blog users: The impact of perceived enjoyment, habit, user involvement and blogging time. *Behaviour and Information Technology*, *32*(6), 570–583.

Subrahmanyam, K., Reich, S. M., Waechter, N., & Espinoza, G. (2008). Online and offline social networks: Use of social networking sites by emerging adults. *Journal of Applied Developmental Psychology*, *29*(6), 420–433.

Tang, C., & Ding, X. (2014). Graduate students' creative professional virtual community behaviors and their creativity. *Computers in Human Behavior*, *41*, 464–470.

Tang, J. T. E., Tang, T. I., & Chiang, C. H. (2014). Blog learning: Effects of users' usefulness and efficiency towards continuance intention. *Behaviour and Information Technology*, *33*(1), 36–50.

Thelwall, M., & Kousha, K. (2014). Academia. edu: Social network or academic network? *The Association for Information Science and Technology*, *65*(4), 721–731.

Tho, H. N. B. (2009). *Analyzing human- technical factors affecting knowledge sharing behavior between headquarters and foreign* (Master's thesis). Shu-Te University, China.

Urista, M., Dong, Q., Day, K., & Merkin, R. S. (2009). Explaining why young adults use MySpace and Facebook through uses and gratifications theory. *Human Communication*, *12*(2), 215–229.

Van Beveren, J. (2002). A model of knowledge acquisition that refocuses knowledge management. *Journal of Knowledge Management*, *6*(1), 18–22.

Vatanasombut, B., Igbaria, M., Stylianou, A. C., & Rodgers, W. (2008). Information systems continuance intention of web-based applications customers: The case of online banking. *Information and Management*, *45*(7), 419–428.

Wagner, C., & Bolloju, N. (2005). Supporting knowledge management in organizations with conversational technologies: Discussion forums, weblogs, and wikis. *Journal of Database Management*, *16*(2), 1.

Wang, H., Meng, Y., & Wang, W. (2013). The role of perceived interactivity in virtual communities: Building trust and increasing stickiness. *Connection Science*, *25*(1), 55–73.

Wenger, E. (2011). *Community of practice: A brief introduction*. <https://scholarsbank.uoregon.edu/xmlui/handle/1794/11736>, retrieved 06.06.2018

Wixom, B. H., & Todd, P. (2005). A theoretical integration of user satisfaction and technology acceptance. *Information Systems Research*, *16*(1), 85–102.

Wong, K. K. K. (2013). Partial least squares structural equation modeling (PLS-SEM) techniques using SmartPLS. *Marketing Bulletin*, *24*(1), 1–32.

Xu, J., & Yuan, X. (2013). Online scholarly publishing in China: Who? What? How? *Learned Publishing*, *26*(2), 89–100.

Zhang, D., Zhou, L., & Nunamaker Jr, J. F. (2002). A knowledge management framework for the support of decision making in humanitarian assistance/disaster relief. *Knowledge and Information Systems*, *4*(3), 370–385.

Zhang, H., Lu, Y., Gupta, S., & Gao, P. (2015). Understanding group-buying websites continuance—An extension of expectation confirmation model. *Internet Research*, *25*(5), 767–793.

Zhang, M., Liu, Y., Yan, W., & Zhang, Y. (2017). Users' continuance intention of virtual learning community services: The moderating role of usage experience. *Interactive Learning Environments*, *25*(6), 685–703.

Zhang, Y., Fang, Y., Wei, K. K., & Chen, H. (2010). Exploring the role of psychological safety in promoting the intention to continue sharing knowledge in virtual communities. *International Journal of Information Management*, *30*(5), 425–436.

Zheng, Y., Zhao, K., & Stylianou, A. (2013). The impacts of information quality and system quality on users' continuance intention in information-exchange virtual communities : An empirical investigation. *Decision Support Systems*, *56*, 513–524.

APPENDICES

Appendix 1 Summary of variables definitions and hypotheses

Variables	*Definition*	*Hypotheses*
Independent variables		
Reputation	A degree to which a person believes that participation in VACs could improve his or her status or gain respect (Hsu & Lin, 2008; Jin, Zhou, Lee, & Cheung, 2013).	H1a: Reputation positively affects young adults' confirmation of beliefs in VACs.
		H1b: Reputation positively affects young adults' perceived usefulness in VACs.
Social relationship trust	An expectation that individual member will follow a generally accepted set of values, norms, and principles (Chiu et al., 2006)	H2a: Social relationship trust has a significant positive influence on confirmation of beliefs in VACs.
		H2b: Social relationship trust has a significant positive influence on perceived usefulness in VACs.
Academic information quality	Users' perception of information completeness and timeliness, academic format, accuracy and preciseness (Laranjeiro et al., 2015; Wixom & Todd, 2005).	H3a: Academic information quality of VACs has a positive impact on young adults' confirmation of beliefs in VACs.
		H3b: Academic information quality of VACs has a positive impact on young adults' perceived usefulness in VACs.
Academic information quantity	The volume of academic information posting and donating per month in VACs (Chang & Chuang, 2011; Schmitt & Jäschke, 2017).	H4a: Academic information quantity of VACs has a positive impact on young adults' confirmation of beliefs in VACs.
		H4b: Academic information quantity of VACs has a positive impact on young adults' perceived usefulness in VACs.
User interface	A system's layout which is arranged and integrated with good figures and clear text (Liu et al., 2010).	H5a: User interface of VACs has a positive impact on young adults' confirmation of beliefs in VACs.
		H5b: User interface of VACs has a positive impact on young adults' perceived usefulness of VACs.
Perceived usefulness	The extent to which young adults believe that using a VAC will enhance their performance (Davis, 1989).	H6: Perceived usefulness has a positive impact on young adults' satisfaction in VACs.
		H7: Perceived usefulness has a positive impact on young adults' continued knowledge sharing in VACs.
Confirmation of belief	The belief that whether one's expectation is confirmed is not only related to the probability of outcomes but also to the evaluation of outcomes (Oliver, 1980).	H8: Confirmation of beliefs has a positive impact on young adults' perceived usefulness in VACs.
		H9: Confirmation of beliefs has a positive impact on young adults' satisfaction in VACs.
Satisfaction	the functions of the expectation level and perceptions of confirmation (Oliver, 1980).	H10: Satisfaction has a positive impact on continued knowledge sharing in VACs.
Dependent variables		
Continued knowledge sharing	Continued knowledge sharing is activities of transferring or disseminating knowledge from one person, group or organization to another, with persistent intention (Lee, 2010).	

Appendix 2 Questionnaire in English

DRIVERS FOR YOUNG ADULTS' CONTINUED KNOWLEDGE SHARING IN CHINESE VIRTUAL ACADEMIC COMMUNITIES

Thank you for your time for this questionnaire. I am a double degree graduate student between Central China Normal University in China and University of Turku in Finland. This questionnaire is anonymous, and it may take about ten minutes. All data is used for statistical analysis and academic research. Please feel free to fill in it.

Definition of Virtual academic communities (VACs): An effective environment of academic knowledge sharing and creation. Groups of people who share the same concern or passion can access up-to-date information via interaction without any physical constraint, such as ScienceNet, Xiaomuchong.

Basic information

1. What is your gender?

(a) Male

(b) Female

2. What is your age?

(a) Less than 18 years old

(b) 18-30 years old

(c) 30-40 years old

(d) 40-50 years old

(e) Above 50 years old

3. What is your educational background?

(a) High school or vocational education

(b) Bachelor degree

(c) Master degree

(d) Ph.D. degree

4. Have you ever used Chinese virtual academic communities, such as ScienceNet, and Xiaomuchong?

(a) Yes

(b) No

5.How long have you used virtual academic communities?

(a) Less than 1 year

(b) 1-2 years

(c) 3-5 years

(d) More than 5 years

6. How long does it take you to use a virtual academic community a week?

(a) Almost no

(b) Less than an hour

(c) 1 to 5 hours

(d) More than 5 hours

Control Variables (Based on five-Likert scale: 1= Strongly disagree; 2= Disagree; 3= Neutral; 4= Agree; 5= Strongly agree)

7. Based on recent experience with VACs, please answer questions about reputation (RE).

RE1. I earn respect from others by sharing knowledge in VACs.	1	2	3	4	5
RE2. I think sharing knowledge in VACs can improve my status in the academic field.	1	2	3	4	5
RE3. I think sharing knowledge in VACs can improve my reputation in the academic field.	1	2	3	4	5

8. Based on recent experience with VACs, please answer questions about social relationship trust (SRT).

SRT1. I have faith in VACs' users and trust them to solve problems.	1	2	3	4	5
SRT2. I have belief that VACs users have good intent and concern.	1	2	3	4	5
SRT3. I have belief in VACs users' reliablity.	1	2	3	4	5
SRT4. I trust academic leaders, I will follow them and use VACs.	1	2	3	4	5

9. Based on recent experience with VACs, please answer questions about quality of academic information (QL).

QL1. The academic information shared by members in VACs is relevant to the topics.	1	2	3	4	5
QL2. The academic information shared by members in VACs is easy to understand.	1	2	3	4	5
QL3. The academic information shared by members in VACs is accurate.	1	2	3	4	5

QL4. The academic information shared by members in VACs is complete.	1	2	3	4	5
QL5. The academic information shared by members in VACs is reliable.	1	2	3	4	5
QL6. The academic information shared by members in VACs is timely.	1	2	3	4	5

10. Based on recent experience with VACs, please answer questions about quantity of academic information (QT).

QT1. I actively participated in activities in VACs.	1	2	3	4	5
QT2. I often contributed academic knowledge to VACs.	1	2	3	4	5

11. Based on recent experience with VACs, please answer questions about user interface (UI).

UI1. Every feature and function in VACs is easy to understand.	1	2	3	4	5
UI2. The VACs are easy to use, even when using it for the first time.	1	2	3	4	5
UI3. The amount of information displayed in the VACs is appropriate.	1	2	3	4	5
UI4. VACs can provide accurate information and functions that I need.	1	2	3	4	5

12. Based on recent experience with VACs, please answer questions about perceived usefulness (PU).

PU1: Using VACs can improve my performance.	1	2	3	4	5
PU2: Using VACs can increase my productivity.	1	2	3	4	5
PU3: VACs can satisfy my academic research-related needs.	1	2	3	4	5

13. Based on recent experience with VACs, please answer questions about satisfaction (SA).

SA1: I am pleased with the experience of using VACs.	1	2	3	4	5
SA2: I am satisfied with the performance of the VACs service.	1	2	3	4	5
SA3: My decision to use VACs was a wise one.	1	2	3	4	5

14. Based on recent experience with VACs, please answer questions about confirmation of beliefs (CoB).

CoB1. My experience with using VACs was better than what I expected.	1	2	3	4	5
CoB2. The perceived service level when using VACs was better than what I expected.	1	2	3	4	5
CoB3. Most of my expectations from using VACs were confirmed.	1	2	3	4	5

15. Based on recent experience with VACs, please answer questions about continued knowledge sharing (CKS).

CKS1. I will continue to use VACs to share academic knowledge in the future.	1	2	3	4	5
CKS2. I will use VACs more than before.	1	2	3	4	5
CKS3. I will continue to use VACs to share academic knowledge rather than any alternative means, such as traditional academic lectures.	1	2	3	4	5

Appendix 3 Questionnaire in Chinese

中国虚拟学术社区青年持续知识共享影响因素研究

非常感谢您填写问卷。我是中国华中师范大学和芬兰图尔库大学的双学位硕士研究生。填写问卷大概需要 10 分钟。问卷调查是匿名，所有数据都用于统计分析和学术研究，请放心填写。

虚拟学术社区的定义：虚拟学术社区是一个学术知识共享和创造的有效环境。不受物理限制，拥有相同兴趣和激情的人可以通过互动来获取最新信息，比如科学网和小木虫。.

基本信息：

1. 您的性别？

(a) 男

(b) 女

2. 您的年龄？

(a) 小于 18 岁

(b) 18-30 岁

(c) 30-40 岁

(d) 40-50 岁

(e) 50 岁以上

3. 您的教育背景？

(a) 高中及职业教育

(b) 本科

(c) 硕士

(d) 博士

4. 您曾使用过中国虚拟学术社区么，如科学网和小木虫等？

(a) 是

(b) 否

5. 您使用虚拟学术社区多久了？

(a) 小于 1 年

(b) 1-2 年

(c) 3-5 年

(d) 5 年以上

6. 您平均一周使用虚拟学术社区的时间?

(a) 几乎不

(b) 小于 1 小时

(c) 1 -5 小时

(d) 多于 5 小时

控制变量 (根据李克特五级量表：1=非常不同意 ; 2= 不同意; 3= 中立; 4= 同意; 5= 非常同意)

7. 根据最近使用虚拟学术社区的经验，请回答有关声誉(RE) 的问题。

RE1. 我通过在虚拟学术社区中分享学术知识来赢得他人的尊重。	1	2	3	4	5
RE2. 我觉得在虚拟学术社区中分享知识可以提高我在学术领域的地位。	1	2	3	4	5
RE3. 我觉得在虚拟学术社区分享知识以提高我在学术领域的声誉。	1	2	3	4	5

8. 根据最近使用虚拟学术社区的经验，请回答有关社会关系的信任(SRT) 的问题。

SRT1. 我对虚拟学术社区的用户有信心，相信他们能解决问题。	1	2	3	4	5
SRT2. 我相信虚拟学术社区的用户有良好的意图和关注点。	1	2	3	4	5
SRT3. 我相信虚拟学术社区的用户是可靠的。	1	2	3	4	5
SRT4. 我相信学术专家，我将关注他们并使用虚拟学术社区。	1	2	3	4	5

9. 根据最近使用虚拟学术社区的经验，请回答有关学术信息质量(QL)的问题。

QL1. 虚拟学术社区中分享的学术信息是与主题相关的。	1	2	3	4	5
QL2. 虚拟学术社区中分享的学术信息是容易理解的。	1	2	3	4	5
QL3. 虚拟学术社区中分享的学术信息是精确的。	1	2	3	4	5
QL4. 虚拟学术社区中分享的学术信息是完整的。	1	2	3	4	5
QL5. 虚拟学术社区中分享的学术信息是可靠的。	1	2	3	4	5
QL6. 虚拟学术社区中分享的学术信息是及时的。	1	2	3	4	5

10. 根据最近使用虚拟学术社区的经验，请回答有关学术信息数量(QT)的问题。

QT1. 我积极参与虚拟学术社区中的活动。	1 2 3 4 5
QT2. 我经常为虚拟学术社区贡献学术信息。	1 2 3 4 5

11. 根据最近使用虚拟学术社区的经验，请回答有关用户界面(UI)的问题。

UI1. 虚拟学术社区的每个特性和功能都很容易理解。	1 2 3 4 5
UI2. 即使第一次使用它，虚拟学术社区也很容易使用。	1 2 3 4 5
UI3. 在虚拟学术社区中显示的信息量是合适的。	1 2 3 4 5
UI4. 虚拟学术社区能提供我需要的准确信息和功能。	1 2 3 4 5

12. 根据最近使用虚拟学术社区的经验，请回答有关感知有用性(PU)的问题。

PP1. 使用虚拟学术社区可以提高我的绩效。	1 2 3 4 5
PP2. 使用虚拟学术社区可以提高我的工作效率。	1 2 3 4 5
PP3. 虚拟学术社区能满足我学术研究相关的需求。	1 2 3 4 5

13. 根据最近使用虚拟学术社区的经验，请回答有关满意度(SA)的问题。

SA1. 我使用虚拟学术社区的经历是愉快的。	1 2 3 4 5
SA2. 我对虚拟学术社区的服务性能是满意的。	1 2 3 4 5
SA3. 我使用虚拟学生社区的决定是明智的。	1 2 3 4 5

14. 根据最近使用虚拟学术社区的经验，请回答有关确认信念(CoB)的问题。

CoB1. 我使用虚拟学术社区的经历比我预期要好。	1 2 3 4 5
CoB2. 使用虚拟学术社区感知到的服务水平比我预期要好。	1 2 3 4 5
CoB3. 我对虚拟学术社区大部分期望都得到了实现。	1 2 3 4 5

15. 根据最近使用虚拟学术社区的经验，请回答有关持续知识共享(CKS)的问题。

CKS1. 在将来我打算继续使用虚拟学术社区来分享学术知识。	1 2 3 4 5
CKS2. 我将会比以前更多地使用虚拟学术社区。	1 2 3 4 5
CKS3. 我将继续使用虚拟学术社区来分享学术知识，而不是使用其他方法，比如传统学术讲座。	1 2 3 4 5

Appendix 4 Outer loadings

	Original Sample (O)	*Sample Mean (M)*	*Standard Deviation (SD)*	*t Statistics (|O/STDEV|)*
CKS1 <- Continued knowledge sharing	0.840	0.839	0.025	33.014
CKS2 <- Continued knowledge sharing	0.743	0.740	0.042	17.709
CKS3 <- Continued knowledge sharing	0.903	0.902	0.019	46.799
CoB1 <- confirmation of beliefs	0.861	0.860	0.019	46.202
CoB2 <- confirmation of beliefs	0.796	0.795	0.029	27.329
CoB3 <- confirmation of beliefs	0.904	0.903	0.016	57.544
PU1 <- perceived usefulness	0.876	0.876	0.018	49.585
PU2 <- perceived usefulness	0.810	0.809	0.026	30.768
PU3 <- perceived usefulness	0.889	0.887	0.017	52.945
QL1 <- academic information quality	0.839	0.836	0.028	30.299
QL2 <- academic information quality	0.702	0.702	0.041	17.302
QL3 <- academic information quality	0.831	0.830	0.028	30.007
QL4 <- academic information quality	0.709	0.708	0.040	17.656
QL5 <- academic information quality	0.819	0.818	0.029	28.567
QL6 <- academic information quality	0.777	0.775	0.034	22.775
QT1 <- academic information quantity	0.870	0.870	0.027	32.016
QT2 <- academic information quantity	0.891	0.890	0.025	36.018
RE1 <- reputation	0.834	0.833	0.022	37.552
RE2 <- reputation	0.857	0.854	0.024	35.314
RE3 <- reputation	0.913	0.913	0.013	70.238
SA1 <- satisfaction	0.844	0.844	0.025	33.805
SA2 <- satisfaction	0.824	0.822	0.030	27.176
SA3 <- satisfaction	0.894	0.893	0.016	55.430
SRT1 <- Social relationship trust	0.811	0.810	0.032	25.608
SRT2 <- Social relationship trust	0.753	0.750	0.041	18.460
SRT3 <- Social relationship trust	0.858	0.858	0.021	40.090
SRT4 <- Social relationship trust	0.740	0.738	0.039	18.859
UI1 <- user interface	0.776	0.776	0.037	21.005
UI2 <- user interface	0.803	0.800	0.034	23.926
UI3 <- user interface	0.818	0.816	0.027	30.492
UI4 <- user interface	0.899	0.899	0.016	57.243