Developing a research framework for virtual community systems

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Abstract: This paper proposes a conceptual framework integrating the drivers and outcomes of usage of virtual community (VC) systems. A through literature review is undertaken emphasising the literature underlying philosophical and theoretical foundations of VC and its usage. Search for empirical evidence on VC adoption is also carried out; in particular, literature relating to drivers of VC, the level of satisfaction of VC members, their belonging and inclination to use VC systems are explored. The possible variables that may moderate the relationship between the drivers of VC usage and users satisfaction are also proposed. The possible moderating variables include the gender, age and level of education of users of the virtual community. A sketch of the conceptual model is provided along with the methods to operationalise the constructs within the model in future research. The possible links between variables are also depicted towards facilitating empirical testing of the model.

Keywords: system quality; common values; mutual benefits; social network; information quality; peer interaction; virtual community.

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1 Introduction

The growth and pervasiveness of the internet and proliferation of network access has facilitated the emergence of a new concept known as the virtual community (VC). This VC is like a physical community but the participants do not gather physically at the same place and time (Rothaermel and Sugiyama, 2001; Tsi and Pai, 2014). Instead, they communicate through the internet at different places and times. Their activities and discussions are similar to that of real communities (Chen and Hung, 2010; Wu et al., 2010). The members of this technology-based community share knowledge and participate in activities for mutual benefit (Chae et al., 2005). Members can form personal relationships through constant personal online communication (Zheng et al., 2013; Spaulding, 2010; Chan and Li, 2010). It is convenient for them to share common interests (Hagel and Amstrong, 1997), conduct business and learn from each other (Rothaermel and Sugiyama, 2001). Technology, particularly the internet, provides the most efficient and effective set of tools for such a learning community (Sun et al., 2014; Duffy et al., 2004). Here the a VC is defined as a group of techno-lovers who share common views, ideas, interests and values and understand the usefulness of a communication technology in a virtual environment that facilitates a benefit-driven reciprocal relationship within members of the group for the same cause.

The impact of the VC is increasingly pervasive, with activities ranging from economics and marketing to social interaction and education (Wang et al., 2014; Teo et al., 2003). The VCs are built to provide and share information, form social networks and facilitate decision making. The VC also helps to facilitate community learning of skills, expertise and experiences through people interacting with one another and accessing a common repository (Teo et al., 2003; Talukder and Yeow, 2007; Sun et al., 2014). Thus, virtual systems can be considered to be an innovative and essential technological advancement that is increasingly accepted as an effective vehicle of communication in the community, in business and academia.

However, little is understood about the factors that are critical to the success of the VC. Given its critical role in today's world, it is very important to understand how these apply to the VC. Without understanding the desirable features of the VC, it would be difficult for organisations and individuals to realise the benefits of this new form of

community. This study fills the gap in the literature by identifying two critical quality and social posture issues that could potentially influence the VC's success.

The model for this study was developed from DeLone and McLean's (1992) information system success model, the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003) and innovation, manufacturing, diffusion and adoption/rejection model (Woodside and Bieman, 2005). The study examines quality issues such as system quality and information quality in their capacity as antecedents of satisfaction and using the VC. Furthermore, the benefit dimension such as common values and mutual benefits are essential to its success. The social dimension includes such phenomena as social networks and peer interactions as being instrumental in the success of the VC. The next section discusses the theoretical framework and hypothesis development, followed by discussion, implications for further research and this study's contribution to the literature.

1.1 Objectives of the research

The main objectives of this study are to:

1 explore the social, technological and benefit factors affecting the use of a VC by its members

2 identify the impact of gender, age and education level on the relationship between social and benefit factors and VC members' satisfaction

3 discuss the academic and managerial implications of the research findings

4 identify the limitations and future research potential in the study of the VC.

1.2 Motivation for the study

The VC is a relatively new phenomenon and research on it has been limited. Although some prior research has focused on important factors affecting the adoption of the VC in general, research examining the VC from a social and technological perspective has remained largely unexplored in the literature. This paper addresses this lacuna by proposing a conceptual framework to broaden our knowledge of the process of practice of the VC and the social and technological factors affecting how members use this community. This research will help organisations and marketers to identify and benchmark strategies to motivate members' participation in the VC and customise these strategies to best fit the unique characteristics of individual members of the VC.

Several theories underpin the dynamism of this area, yet there is no integrated futuristic model on the VC in the extant literature. Although a few studies have explored the antecedents and outcomes of practice of the VC, an organised approach to research in this area is absent in the literature. This lacuna in the literature prompted this study to provide a suitable framework that can be utilised in future empirical studies. In order to provide a basis for future studies, we have not only presented the predictors and outcome variables, but also presented a number of well grounded propositions so that future studies can clearly use our resulting propositions to generate theoretically sound rigorous analysis.

2 Literature and theoretical framework

The literature on this topic is mainly devoted to the dissemination of relevant information to develop a conceptual structure capturing the leading drivers of VCs and how these impact on how VCs function. A number of studies came up with some interesting findings regarding the possible determining factors that shape users' propensity to use the VC. For example, Leimeister et al. (2006) identify 32 success factors for the practice of the VC. Although many of these factors do overlap, they hint at of the possible drivers that are relevant for shaping how the VC is employed. Gannon-Leary and Fontainha (2007) identify 19 overlapping factors. These two studies report some common factors which established the basis for identifying the most relevant factors affecting usage of the VC. Chiu et al. (2006), Rothaermel and Sugiyama (2001), and Zeng et al. (2009) found 9, 8 and 3 factors respectively. A careful review of all the factors in the above studies revealed that many factors are widespread and form the basis for selecting the most important variables. It should be noted, however, that some factors have emerged as a result of empirical research while others have been proposed based on the authors' observation and experience. Finally, four variables have been prominent in previously published studies concerning the VC: these are common values, social usefulness, system quality and information quality.

2.1 Theoretical framework and development of propositions

This study uses Woodside and Biemans's innovation, manufacturing, diffusion, adoption/rejection (IMDAR) model, DeLone and McLean's information system success model and the UTAUT as the main basis for the theoretical construct. The details of the theoretical background are discussed below.

2.1.1 Woodside and Biemans's IMDAR model

IMDAR is a pioneering initiative in the innovation adoption and diffusion area. This model was originally initiated by Woodside and Voss (1999) which was further expanded in a later study by Woodside and Biemans (2005). This model broadly captures the complexities and dynamics of innovation management in a comprehensive manner that has not been explored previously. This is the only model that advances the theoretical discourse concerning antecedents and outcomes of innovation adoption by integrating a diverse range of predictive variables affecting the innovation adoption/rejection and diffusion process. In order to specifically demonstrate the relevance of this complex schema, the authors present a series of specific frameworks capturing the possible predictors of individual and organisational adoption of innovation. This model is therefore considered to be the most relevant for developing further frameworks that investigate antecedents and consequences of innovation adoption and diffusion in specific areas of interest. As a focused area of study, VC-related research is relatively new in that the predictors of practice of VC have not been specifically identified. The existing models such as TAM, TRA and TPB seem to have been over-used and obsolete. Therefore, Woodside and Biemans's (2005) models have been used to develop our model of VC alongside the other frameworks that have been reported in the innovation literature in recent times.

2.1.2 DeLone and McLean's information system success model

DeLone and McLean (1992) develop a model for information system success that describe how system quality and information quality affects user satisfaction and practical matters. The model posits that user satisfaction and use are direct antecedents of individual impact which leads to organisational impact. DeLone and McLean characterise system quality as desired characteristics of the information system itself and it measures technical success; while information quality refers to desired characteristics of the information product and the measurement of semantic success. User satisfaction, use, and individual and organisational impact measure success in terms of effectiveness and this refer to the impact that information has on the receiver (DeLone and McLean, 1992; Livari, 2002; Lin, 2008; Zheng et al., 2013).

DeLone and McLean propose that there are causal relationships among these six dimensions and they are interrelated. According to DeLone and McLean the information system contains important features exhibiting various degrees of the system and information quality. Users experience those features by employing the system and they are either satisfied or dissatisfied with the system or information quality. These usages impact on how the individual users conduct their work and individually and collectively on the organisation.

Since VCs are characterised as non-physical, shared knowledge and common interests, members' satisfaction is an important factor for a user who considers becoming a member and participating in the VC. In this context, system quality and information quality determine members' satisfaction. Satisfaction is considered to be one of the crucial factors in the success of the VC. Furthermore, because the community is virtual in nature, a sense of belongingness is important if one wants to be engaged in it. Participation in a VC plays a significant role in expanding the community and member participation has been considered critical in influencing the effectiveness of the VC. DeLone and McLean's model incorporated a similar individual variable and examined the impact of such a variable on organisational performance. Therefore, system and information quality determines member satisfaction which in turn leads to a sense of belongingness. Member belongingness affects the desire and level of participation in the VC. Thus, the following propositions are developed:

P1 System quality influences member satisfaction of the VC.

P2 Information quality affects member satisfaction with the VC.

P3 Member satisfaction affects sense of belongingness with the VC.

P4 Sense of belongingness affects participation in the VC.

2.1.3 The UTAUT

Venkatesh et al. (2003) develop the UTAUT and it integrates eight previously developed models and theories concerning the acceptance and use of technology. The theory postulates that the behavioural intention to use technology is determined by performance expectancy, effort expectancy and social influence. Facilitating conditions directly impact on usage behaviour.

Social influence as a direct determinant of behavioural intention is represented as a subjective norm in theory of reasoned action (TRA), technology acceptance model 2

(TAM2) and theory of planned behaviour (TPB). Similarly, Frambach and Schillewaert (2002) stated that social factors influence individual acceptance of innovation. Woodside and Bieman (2005) propose that individual acceptance of innovations is driven by an innovation's use in the social environment. Such social influences affect individual attitudes toward acceptance and such influences may stem from various sources including network externalities. In the context of the VC, social factors affect members' satisfaction which consequently leads to action to participate in the community. Consequently, instead of behavioural intention, satisfaction is more appropriate in the VC scenario. This study proposes two social factors – social network and peer interaction.

VCs are groups of people brought together by members' common interests, goals, preferences and values. Community members who share common values are more likely to become virtual partners sharing their ideas and resources. Shared values bind the members of human networks and communities which make cooperative action and benefit the community (Cohen and Prusak, 2001). When the participants of a VC have common values, they will be happier to become members of the community, which in turn increases their sense of belongingness and ultimately helps them to become active members of the community. On the other hand, social usefulness refers to the benefits and advantages that members receive when they participate in the VC. The VC facilitates knowledge sharing which has obvious benefits such as reduced communication costs and faster problem-solving (Chen and Hung, 2010). Individuals become members of a VC for the reward of enriching knowledge, seeking peer support and making friends in the virtual world. VC members are seen as knowledgeable, skilled and well informed. Hence, social usefulness would have an impact on the level of satisfaction of VC members. Four propositions are described:

P5 Social network influences satisfaction of the VC.

P6 Peers interaction influences satisfaction of the VC.

P7 Members' common values influence their satisfaction of the VC.

P8 Mutual benefits influence member satisfaction of the VC.

In the UTAUT model, gender, age and voluntariness have moderated the relationship between social influence and behavioural intention (Venkatesh et al., 2003). More recently, Talukder and Quazi (2011) tested the moderating effects of age and gender on the causal relationships between social network and technology usage behaviour as well as between peer influence and technology behaviour in an organisational setting in Australia. Recent research findings suggest that users' demographic information such as education significantly affect technology acceptance behaviour (Woodside and Biemans, 2005; Quazi and Talukder, 2011). However, the same study did not reveal that age had a significant impact on the technology acceptance behaviour of users in Australia.

In the virtual organisation context, however, age is shown to moderate the sharing of common values, ideas and norms across community members. Age is also likely to moderate social usefulness in terms of perceived support such as respect, recognition and approval from VC members when the virtual community is operating. Furthermore, level of education would moderate sharing common values in terms of community members' communication of their messages, sharing common values and norms. Education also moderates social usefulness in terms of knowledge sharing skills and problem-solving issues among participating members. In addition, gender is shown as moderating social

dimensions and members' satisfaction. Therefore, the following propositions would be worth testing:

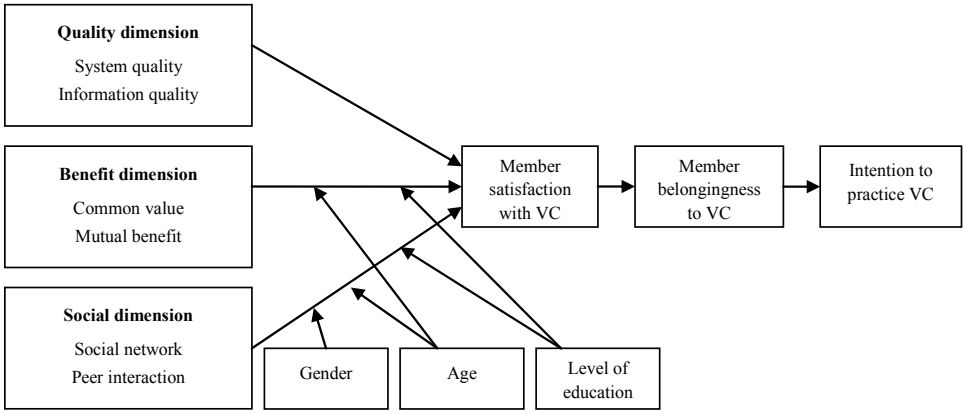
P9 The impact of common values and mutual benefits on member satisfaction will be moderated by gender, age and level of education.

P10 The impact of social network and peer interaction on member satisfaction will be moderated by gender, age and level of education.

2.2 The research model

The following section presents the research model for empirical testing. The structure of the research model has been developed based on the relevant literature and the theoretical perspectives detailed earlier in this paper.

Figure 1 A conceptual model of VC system



The model has been based on a number of established and well researched theoretical frameworks. For this model the possible interconnections between those theoretical realities are reflected in the drivers and outcomes of the virtual system. The model consists of five fields – technological dimension, benefit dimension, social dimension, members' satisfaction, members' belongingness, actual practice of the VC and the moderating factors. A total of nine boxes are included within these five fields. Three boxes contain technological factors, benefit factors and social factors as the independent variables that are classified into the quality dimension, benefit dimension and social dimension. These three boxes are further compartmentalised into six factors, namely system quality and information quality, common value and mutual benefits, and social network and peer interaction. The fourth box is about members' satisfaction as a dependent variable in relation to technological factors, benefits factors and social factors. This box also contains an independent variable to the fifth box concerning members' sense of belongingness. The sixth box – practice of the VC by its members – is a dependent variable in relation to the fifth box (members' belongingness). The other three boxes – gender, age and level of education – are the factors that moderate the relationship between benefits, social factors and members' satisfaction. Figure 1 depicts the boxes described above within the conceptual model. The specific variables included in the boxes are detailed below.

2.2.1 Quality dimension

The quality dimension box contains two variables that capture the quality aspect of the drivers of the VC. These variables represent both the technical quality of the computer system itself and the quality of the information that is communicated amongst members of the VC (Zheng et al., 2013).

2.2.2 Benefit dimension

Benefit dimension represents two variables capturing aspects of social benefits that members can derive from being involved in VCs. The dimension also includes common values held by members that help them develop close bonds that facilitate relationships (Sun et al., 2014).

2.2.3 Social dimension

Social dimension is measured in terms of two established constructs such as social network and peer interactions. Social interaction is introduced in the model as a new variable to capture the emerging importance of social interaction as a determinant of effective virtual communication in the community. These variables have been investigated in the literature especially in the context of technology acceptance and usage. Of these two variables the impact of social networks on technology adoption behaviour has been extensively explored in the literature (Tsi and Pai, 2014; Talukder and Quazi, 2011; Zheng et al., 2013; Talukder, 2014; Wang et al., 2014) and research on the impact of peer interaction on technology adoption is starting to emerge.

2.2.3.1 Social network

Social network is a well established construct which was originally used in innovation acceptance and usage-related research. In particular this construct has been extensively applied in the realm of technology adoption and diffusion research at the international level. This construct is especially important in VC-related research because social interaction is an important issue that drives members to become committed to the VC and increases the use of VC technology.

2.2.3.2 Peer interaction

Members of a VC are actively engaged in frequent interactions with other members. Members prefer to interact with other people who have similar interests and are influenced by each other when using virtual communication. Literature relating to peer influence on the usage of technological innovation is well established but little has been published as to how peers can influence a member in developing an attitude and using a particular VC.

It should be noted that the social dimension is an emerging reality in the VC. Prior research on information technology has not extensively integrated this dimension into the practice of a VC. However, the current trends in VC research suggest that the social dimension is becoming increasingly popular to users. Some contemporary studies on the adoption and use of innovative technology have found that social factors positively

impact on innovation users' behaviour (Talukder and Quazi, 2011; Venkatesh and Brown, 2001).

The above factors fit well within the VC environment and do impact on members' satisfaction, leading to their commitment to the VC. Ultimate practice behaviour needs to be measured so that an empirical investigation can be conducted into our proposed framework using both qualitative and quantitative research techniques.

2.2.4 Demographic factors

2.2.4.1 Gender

Existing studies have mixed results about the impact of gender on the attitude and acceptance of innovation in the workplace. Studies found that males are more attracted to and skilled in the use of computers than females (Lerouge et al., 2005). The author stated that males use innovation significantly at a higher level than their female counterparts. Other studies revealed that females tend to use innovation at a higher rate than males (Bhatnagar and Ghose, 2004). Sanchez-Franco (2006) mentioned that males perceive the benefits of using technological innovation more than female users. However, Choudrie and Dwivedi (2005) found no evidence that gender influenced the adoption of innovation. Therefore, it is important to investigate the impact of gender in VC system adoption.

2.2.4.2 Age

Age was perceived to be an important determinant in the innovation adoption process (Bayo-Moriones and Lera-Lopez, 2007). Lin et al. (2011) found that younger people are more inclined to try new innovation such as social networks. Research has found that older people aged between 50 and above prefer to use their innovation skills significantly less than those aged between 20 to 29 and 40 to 49 (Lerouge et al., 2005). Since many older people have limited experience in using computers and the internet than their younger counterparts, it is likely that learning to use innovation would create an anxiety-provoking situation amongst the potential users (Porter and Donthu, 2006). In contrary, Yi et al. (2006) found that age difference does not really have such an impact. Thus, the above literature does not provide a clear direction as to the impact of age on perception and usage of innovation. Therefore, it is essential to investigate the age impact on the adoption of VC systems.

2.2.4.3 Education level

Education is an important demographic variable determining the use of innovation adoption. Formal education helps users to operate and appreciate innovations in the workplace. The decision to adopt an innovation is related to the amount of knowledge one has regarding how to use the technology appropriately (Porter and Donthu, 2006). Early adopters of new technologies tend to have higher educational levels and better knowledge and this possibly reflects their ability to understand more quickly than those with less education (Porter and Donthu, 2006; Rogers, 2003). Less educated individuals may feel that they have an inadequate knowledge-base, more computer anxiety and less sophisticated cognitive structures that impede their ability to learn (Porter and Donthu, 2006).

2.2.5 Member satisfaction

Measurement of level of satisfaction with a particular phenomenon has been extensively explored in the literature (Sun et al., 2014; Zheng et al., 2013; Tsi and Pai, 2014). However, for the purpose of this model the level of satisfaction of virtual system users has been linked to a number of factors including the quality of the system, perceived level of usefulness of the system and the level of social interactions with the VC. Determining the VC members' level of satisfaction is crucial because satisfaction will lead to the development of a sense of commitment to the VC system.

2.2.6 Member belongingness

Member belongingness to the VC is influenced by the degree to which members are satisfied with the VC system. Since belongingness is likely to result in actual practice of this system, determining members' level of commitment to it is critical in order to understand how their intention to practice a VC system is shaped.

2.2.7 Intention to practice virtual system

This is the final outcome variable in the model and it points to the actual intention of members in terms of their usage behaviour of the VC system. This behavioural construct has been operationalised and extensively explored in other studies. This behavioural construct is measured using the typical items that have been popularly used in innovative systems.

2.2.8 Moderating variables

Three variables have been added to the model because these demographic features are believed to moderate the nexus between antecedents and member satisfaction of a VC system. Extant literature in related fields supports these variables. The above variables have been developed and included in the theoretical model based on an extensive literature search. Table 1 shows the sources of the constructs with reference to the context of those constructs' integration in the conceptual model in Figure 1.

Table 1 The sources of information used in developing the model's leading variables

Factors/drivers/ antecedents	*Source*	*Comments*
Members	Zhang et al. (2010), Leimeister et al. (2006) and Rothaermel and Sugiyama (2001)	Not directly included in the model
Trust	Lin (2008), Zhang et al. (2010), Hsu et al. (2007), Chiu et al. (2006), Rothaermel and Sugiyama (2001), Gannon-Leary and Fontainha (2007) and Leimeister et al. (2006)	Indirectly considered for developing a similar variable
Share knowledge	Chen and Hung (2010), Zhang et al. (2010), Hsu et al. (2007), Chiu et al. (2006) and Gannon-Leary and Fontainha (2007)	Used in a different context in the model

Table 1 The sources of information used in developing the model's leading variables (continued)

Factors/drivers/ antecedents	*Source*	*Comments*
Community	Valck et al. (2009), Teo et al. (2003), Chen and Hung (2010), Casalo et al. (2010), Hsu et al. (2007), Rothaermel and Sugiyama (2001) and Leimeister et al. (2006)	Directly integrated into a specific variable
Social usefulness	Teo et al. (2003), Chen and Hung (2010) and Lin et al. (2008)	Adopted for the model
Satisfaction	Zhang et al. (2010), Zheng et al. (2013), Casalo et al. (2010), Lin et al. (2008), Wu et al. (2010) and Sun et al. (2014)	Exactly adopted in the model as a variable
Regulations	Chen and Hung (2010), Chiu et al. (2006), Gannon-Leary and Fontainha (2007), Leimeister et al. (2006) and Zhang et al. (2010)	Indirectly used in another variable formation
Loyalty	Casalo et al. (2010) and Lin et al. (2008)	Used in forming another related variable
Belongingness	Lin et al. (2008), Gannon-Leary and Fontainha (2007), Teo et al. (2003), Zhang et al. (2010) and Chan and Li (2010)	Directly used in the model
System quality	Zheng et al. (2013), Lin et al. (2008), Teo et al. (2003), Rothaermel and Sugiyama (2001), Gannon-Leary and Fontainha (2007) and Leimeister et al. (2006)	Directly used in the model
Information quality	Lin et al. (2008), Rothaermel and Sugiyama (2001), Gannon-Leary and Fontainha (2007), Leimeister et al. (2006) and Zheng et al. (2013)	Exactly included in the model development
Common values	Chiu et al. (2006), Gannon-Leary and Fontainha (2007), Chan and Li (2010), Wu et al. (2010) and Sun et al. (2014)	Included as it is in model formation
Social network	Venkatesh and Brown (2001), Frambach and Schillewaert (2002), Sledgianowski and Kulviwat (2009), Talukder and Quazi (2011), Lu and Yang (2011), Talukder et al. (2008) and Wang et al. (2014)	Originated from technology adoption literature including the latest UTAUT. The variable 'social network' is included in the study model because it is considered relevant to the VC.
Peer interaction	Sykes et al. (2009), Brown and Venkatesh (2005), Sledgianowski and Kulviwat (2009), Frambach and Schillewaert (2002) and Talukder and Quazi (2011)	Adopted from literature on technology usage and diffusion. Included in the model with a slight change to its name.
Intention to use	Tsi and Pai (2014), Zheng et al. (2013) and Teo et al. (2003)	Used indirectly in the model
Demographics	Lerouge et al. (2005), Porter and Donthu (2006) and Yi et al. (2006)	Included as moderating variables.

3 Method

Since this study is essentially based on published information, the desk method of data collection has been deemed appropriate. The study involves collection, summarisation, synthesisation and dissemination of published information concerning VCs. The research used VC statistics, published reports, journals and conference papers as the sources of information. Furthermore, any other data available in the extant literature has also been reviewed and included for analysis and discussion. A total of 60 articles directly and indirectly related to VCs were reviewed of which 44 were deemed usable given the criteria selected for choosing and finalising a paper for inclusion in the final list. Each paper was examined in terms of whether it contains at least some of the aspects of VC that we were looking for. The main themes around which the selection process was set included:

1 the quality of VC

2 benefits of VC

3 social orientation of VC.

The topics ranged from technology, information systems, virtual system and VC-based management and marketing-based studies. Developing the conceptual model involved a number of steps, including:

Step 1 Pre-literature search.

Designing a conceptual model on the virtual system arose as the authors worked on projects concerning the usage behaviour of technological innovations in many contexts. This initial intellectual query led to a search for information on the VC. The search revealed some isolated publications lacking any specific focus.

Step 2 Initial literature search.

The initial revelation concerning information on VCs motivated the research team to look for further information which resulted in an initial literature search. The initial literature review involved a search for more specific data on the antecedents of the VC.

Step 3 Formal literature review.

A formal review of the literature was conducted in order to collect an advanced level of information on the drivers and outcomes of practicing virtual systems. The search involved finding information on advanced features of the VC including the relationships between perception and utilisation of the VC.

Step 4 Advanced literature review.

The advanced literature search looked for more complex and sophisticated information that would be instrumental in developing a practical and new model of the VC.

Step 5 Development of a conceptual model of the VC.

Finally, a model of the VC is developed that documents the possible antecedents, outcomes and factors moderating the relationships between the origins and outcomes of a VC system.

3.1 Operationalisation of the variables

The items measuring the various constructs were adopted from already developed and validated measures and were modified to suit this study (see Table 2). Regarding the operationalisation of the construct, statements that best describe the construct have been developed with necessary modifications from their original sources. As mentioned above the validation of these items has been confirmed following a five-point procedure. Furthermore, the operationalisation process also involves not only rewriting the statements but also making sure that the original themes of the statements reflect the nature of the construct they represent. The construct is not the exact term used in the literature. The naming of the construct involves choosing a name that generally reflects the underlining theme captured in relevant prior studies. The relevant constructs in Table 2.

Table 2 Construct and measures

Constructs	*Source*	*Items (items are measurable on a 7-point scale ranging from 1 = strongly disagree to 7 = strongly agree)*
System quality	DeLone and McLean (1992) and Lin (2008)	The VC operates reliably
		The VC allows information to be readily accessible to me
		It takes a short time for the VC to response my request
		The VC can be adapted to meet a variety of needs
		The VC is easy to use
Information quality	DeLone and McLean (1992), Chiu et al. (2006) and Lin (2008)	The information provided by the VC is accurate
		The information from the VC is always up to date
		The VC provides me with all the information I need
		The VC provides me with reliable information
		The VC provides me with a complete set of information
Common values	Zeng et al. (2009) and Chiu et al. (2006)	My identity in the community is similar to other members
		My identity is congruent with the community theme
		I am a valuable member of the community
		I support actions that benefit the community
		My self image is harmonious with the community image
Mutual benefits	Lin (2008) and Teo et al. (2003)	Using the VC helps me to obtain respect from others
		Using the VC gives me the opportunity to recommend ideas
		Using VC helps me to form warm relationships with others
		Using the VC improves my understanding of the issues
		Using the VC helps satisfy my social needs

Note: Some scales have been modified from the original ones to suit the needs of this paper.

Table 2 Construct and measures (continued)

Constructs	*Source*	*Items (items are measurable on a 7-point scale ranging from 1 = strongly disagree to 7 = strongly agree)*
Social network	Talukder and Quazi (2011)	People in my discipline think that using the VC is valuable.
		I use the VC because our interrelated organisations also use the VC.
		I use the VC because my colleagues in other institutions use the VC.
		I use the VC because my social network uses a similar system.
Peer interaction	Talukder and Quazi (2011)	I learned from my friends how to use the VC successfully.
		Communicating with my friends helped learn me about the VC.
		I use the VC following my friends who use a similar VC forum.
Member satisfaction	DeLone and McLeon (1992), Casalo et al. (2010) and Lin (2008)	I am satisfied with my experience with the VC
		I am satisfied with my interaction with the VC
		The VC information content meets my needs
		The VC fulfils my expectations
		Overall, I am satisfied with the VC
Member belongingness	Teo et al. (2003) and Lin (2008)	I feel a strong sense of belonging to the VC
		I enjoy being a member of the VC
		I am very committed to the VC
		I am strongly attached to the community
		Overall, the VC has a high level of morale
Practice of VC	Casalo et al. (2010), Koh and Kim (2004) and Fang and Chiu (2010)	I am very motivated to participate actively in VC activities
		I provide useful information to other community members
		I post messages and responses in the VC
		I use the VC enthusiastically and frequently
		I generally use to stimulate VC
		I made the correct decision participate in the VC

Note: Some scales have been modified from the original ones to suit the needs of this paper.

3.1.1 System quality

The system quality is concerned with the consistency of the user interface, system accessibility, ease of use, system reliability, data accuracy, response time and system flexibility (DeLone and McLean, 1992; Lin, 2008).

3.1.2 Information quality

Information quality is concerned with issues such as reliability, timeliness, relevance, completeness and accuracy of information generated by the VC (DeLone and McLean, 1992; Chiu et al., 2006; Lin, 2008).

3.1.3 Common values

Common values refer to the set of shared goals, values, beliefs, norms and conventions understood and committed to by the VC members (Zeng et al., 2009; Chiu et al., 2006).

3.1.4 Mutual benefits

Social usefulness refers to perceived support such as help, respect, recognition and approval received from other community members when using the VC (Lin, 2008; Teo et al., 2003).

3.1.5 Social network

Members of a VC are interconnected through a social bonding which helps members establish a close interactive association. This association is instrumental in influencing each other's behaviour in relation to the practice of a VC. This association has been variously described as social network (Venkatesh and Brown, 2001), professional peers (Lewis et al., 2003) and friends and family influence (Brown and Venkatesh, 2005). We have integrated social network as a sub-construct within the social dimension. It is one of the main predictors of members' satisfaction and consequent practice of a VC because such inclusion is consistent with the findings of contemporary research (e.g., Woodside, 1996; Talukder et al., 2008; Talukder and Quazi, 2011).

3.1.6 Peer interaction

Peer interaction refers to the state of interactive relationships between users of a VC. Members of a VC system are continuously influenced by their fellow users in terms of encouragement and motivation in staying in it and communicating and sharing each others' views and perspectives on issues that interest members. Researchers have variously described peer interactions as 'peers usage' (Frambach and Schillewaert, 2002), or 'work place referent's influence' (Brown and Venkatesh, 2005). Prior studies have found evidence that peers influence their fellow users in adopting and practicing a new technology (Mirvis et al., 1991; Talukder and Quazi, 2011).

3.1.7 Member satisfaction

Satisfaction is the result of the individual's perception that the benefits received from participating in the group are equal or greater to the expected benefits. Member

satisfaction is concerned with how well participants' information needs are being fulfilled (DeLone and McLean, 1992; Casalo et al., 2010; Lin, 2008).

3.1.8 Member belongingness

Members' belongingness is the cognitive state of mind of VC members, where they feel part of the community and have some sense of ownership. Sense of belongingness leads to participation and involvement in the community (Teo et al., 2003; Lin, 2008).

3.1.9 Practice of the VC

Practice is concerned with the level of involvement with the VC. Four factors are considered when measuring participation behaviour in a VC: firstly, motivation to interact with other community members; secondly, contribution to the community with useful content and information to help other members; thirdly, the effort to stimulate the community; and fourthly, the excitement with which an individual posts messages and responds to the community (Casalo et al., 2010; Koh and Kim, 2004).

4 Discussion of findings

This exploratory research aimed to develop a conceptually driven and empirically testable framework for broadening and deepening our understanding of the complexities surrounding the conceptually constructed variables that affect the practice of VC by its members who are committed to it. An in-depth literature search coupled with the authors' experience and observations reveal that there are three broad categories of predictor variables that are likely to influence members' level of satisfaction leading to their commitment in terms of solidarity with the virtual system. Once belongingness of members is established, the loyalty to the VC is confirmed, which would direct the practicing member to the ultimate usage and practice of the virtual system in their daily activities. The three moderating or intervening variables are added to the model in order to accommodate some of the latest theoretical developments in contemporary research concerning the use of virtual systems. The unified model that integrated the demographic profiles of users of the VC is the most practical model that captures the reality that users' characteristics are vital considerations in making a VC acceptable and practicable to the its members and potential members. All research propositions have been devised on the basis of the above arguments. The operationalisation procedures of all constructs suggested in the paper reflect the latest thoughts and evidence in the extant literature. However, it should be noted that the operationalisation approach to any construct depends on the objectives and scope of any research where these variables would be used. The social dimension has been added as a new construct considering its growing importance as evidenced in the innovation management and diffusion literature. The two specific variables that describe these constructs such as peer interactions and social network have been explored in prior studies in different contexts internationally both in qualitative and quantitative terms. We believe that these emerging variables will drive the future growth of VC at the individual and organisational level in both developed and emerging economies.

4.1 Practical application of the framework

The framework developed in this paper has both academic and commercial applications. Firstly, prospective researchers can use the model for empirical testing by adjusting it to their specific needs. The scales suggested in the paper can be adopted to test the relevant constructs. Higher degree research students would also find the model useful as a framework for their studies especially those interested in virtual systems. Secondly, industry research can also test the model in terms of broadening their understanding of the determinants of usage of a virtual system which in turn will help develop an effective communication strategy aimed at promoting their goods, ideas and services to members of VCs. Public sector organisations can also employ the model to reach their stakeholders when the virtual system is used as a social marketing medium. Various interest groups such as lobbyists can make good use of the framework to share relevant information with social peers to help disseminate their views and perspectives at the national and international levels. People suffering from chronic diseases may find that the model is helpful in developing their interactive network so that they can share some personal information with VC members, and build a support/assistance network for their problems.

4.1.1 For researchers

Researchers can use VC-related research findings to advance their research projects, particularly as the model makes a significant contribution to advancing knowledge of the model and theory building in VC areas. This model can then be empirically tested with real data and the outcomes of such research will have implications for further research in the area. These efforts will result in the development of new ideas and variables.

4.1.2 For intending higher degree by research candidates

Higher degree by research (HDR) candidates always looks for new frameworks for their theses. Since the previous models that originated from the technology adoption literature have been over-used in the past, this model will provide deeper and newer insights in a more focused way. HDR students interested in the VC field will certainly find the current model useful for their studies.

4.1.3 Commercial users

Users intending to use the VC to disseminate information to their clients and customers such as promoting or selling their products will find this model beneficial in communicating to their target market.

4.1.4 Public service users

Public sector enterprises and departments can also make good use of the model in terms of discovering those factors that drive their networking with stakeholders. In particular the social awareness-related communication can be facilitated by using the VC as depicted in the model.

4.1.5 Non-profit sector users including NGOs

The model would also benefit NGOs in terms of identifying the predictors of usage of VCs and developing appropriate communication strategies to effectively reach their stakeholders and clients.

4.1.6 The consumers

General consumers may also use the model as a guideline to search for information about products and services they purchase for their day-to-day use and consumption.

5 Conclusions and implications

The model is principally literature-based because the concept of VC is a new one that has emerged in an ever-changing technology-driven world. This dynamism is captured in the formulation and structural framework of the proposed model.

A vacuum existed in the extant literature concerning a suitable theoretical model to undertake empirical research in this field. This is because the concept of the VC is relatively novel in that the issues surrounding its origins and outcomes were unknown in academic research. This observation, however, applies to all technologically-driven disciplines where research has contributed to continuous improvement of the systems through trial and error. The VC is not an exception to this principle.

Information was fairly scattered regarding possible items to measure the constructs proposed in the model. This research has pulled that scattered information together and streamlined it in the VC context. The items are then developed in the right format to suit the needs of future empirically-based VC research. The model can be tested both quantitatively (such as multiple regression and SEM) and qualitatively (grounded theory using focus group, expert opinion and case studies) or by using a mixed methodology. The model can be utilised by a variety of intended users depending on their respective needs and preferences as discussed above.

To sum up, the conceptual model presented in this paper is a tentative framework capturing the relevant antecedents and outcomes of the VC. The propositions suggested here reflect the proposed linkages between variables that are subject to empirical testing, using a quantitative research technique or a mixed methodology. In this research we have constructed a theoretical and conceptual model of the VC that explains how members of the community use the technology and what they expect their membership to provide. The study has identified the social and technological factors that determine VC member satisfaction. The information search revealed that member satisfaction leads to a cognitive state of belongingness with the community which ultimately leads to the practice of the VC. This study therefore demonstrates the importance of normative drivers as well as technological and social factors that determine the members' participation and continuous use of a VC site.

This study has important implications in terms of making a contribution to theory development as well as enhancing the use of emerging technologies. This paper

contributes substantially to developing a comprehensive framework that captures the drivers and outcomes of using the VC. It explains how members and business people are increasingly using the system as a vehicle for communicating their messages nationally and internationally. Another important theoretical contribution is the introduction of variables that are likely to moderate the relationships between the constructs which had not been integrated in models developed in prior studies.

Another implication for practice includes facilitating the opportunity to share ideas and knowledge amongst members which would have been difficult to do in the absence of the VC. For example, members would have hesitated to share sensitive and confidential information (such as HIV-related issues) in traditional face-to-face communication. Members of a VC would feel free to communicate to other members who are in a similar situation. Furthermore, the proposed model will guide practitioners to develop training programs for intending VC users, keeping in mind the connections between the variables; especially those linked to the practice of virtual systems. Another interesting implication would be for organisations that can utilise the VC to promote their products and services nationally and internationally. There are also implications for the sponsors of VCs.

Since the VC is an integral part of an advanced form of social and peer networking, organisations and individuals can greatly benefit from such an organised social community. For example, practicing members can not only exchange views and perspectives with fellow members, they can also find solutions to many social and family issues of a personal nature such as relationships issues. On the theoretical front businesses and organisations providing/sponsoring the VC should ensure that a VC's members are satisfied with its content and technological quality, which has been identified as the primary contributors to VC members' satisfaction.

The present research has combined a number of variables in the context of VCs. Three dimensions as determinants of virtual members' satisfaction have been identified in the literature and are integrated in the model. The value of exploring the relationship between these two variables lies in the fact that previous research has not investigated the nexus between these two variables. Therefore, the possible findings emerging from the results of such inquiry will provide readers with an idea of the critical factors that are instrumental in understanding the degree of satisfaction of VC. The model further adds a number of moderating variable which the literature demonstrated that these intervening variables such as age, gender and level of education would contribute to understanding of the complexities associated with the link between the above variables. The next set of relationship involves members' satisfaction with their loyalty to VC. The possible findings from this link would provide clues as to whether satisfaction drives members' belongingness to VC. Understanding the level of such belongingness is crucial because loyalty is likely to translate into actual use of VC. The above variables have been incorporated into the research framework to create a comprehensive model. To date no research has addressed all these aspects in a comprehensive and unified way. This study has contributed to broadening and deepening our understanding of the key relationships between the drivers and outcomes of VCs which can be viewed through the lens of the empirically testable framework. This framework provides a well throughout structure for testing by prospective and established researchers interested in exploring how VCs are growing exponentially in the information revolution era.

5.1 Newness of the model

The apparent novelty of this paper lies in its content and focus. Content-wise the paper proposes a clearly delineated model with new elements in it that can be utilised for further research in VC-related investigations. This paper sheds light on the key variables and their possible relationships in a researchable fashion. The sources of the variables and their theoretical roots are also uncovered. The paper then focuses on a number of well grounded propositions arising out of the assumed relationships between variables so that researchers can use the literature and theories underpinning the propositions for future analysis. The paper goes further by showing how these relationships can be empirically measured by clearly identifying the scales comprising each construct. Finally, this paper addresses the apparent lacuna in the extant literature concerning the antecedents and outcomes of VC systems and suggests a well founded framework to advance further research in the field.

6 Limitations and future study

Despite the study providing some valuable insights into the nature of VCs, it has some limitations. Firstly, the data and information was gathered from secondary sources and in particular online databases. Further research is needed to verify the generalisability of our findings. Secondly, the study does not use real participants' behaviour patterns and does not test the model. This study is conceptual and it needs to be tested empirically to support the model. Thirdly, the study focuses on important factors such as social posture, technological quality and usefulness to measure the success and practice of the VC according to its members. The study does not consider additional antecedents. This study provides an opportunity for future research and to test the conceptual model developed in this paper. Certain propositions have been developed and all the constructs and scales have been provided for future investigation. Future studies can use the SEM approach to test the model.

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