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Effects of technical and social design on virtual community identification: a comparison approach

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We investigated how virtual community (VC) design, both technical and social decisions adopted by VC management teams, might affect the development of members' identification with the VC. Adopting a comparison approach developed in studying formal organisational identification, we develop the research model explaining the effects of VC design on VC identification. A survey study involving 412 members from seven VCs revealed that identified VC design factors (community presentation and community empowerment) have significant impacts on identification by making the perceived VC identities attractive. We concluded with a discussion of the key managerial and research implications of our findings.

Keywords: social identity theories; identification; virtual communities; community design

1. Introduction

Virtual communities (VCs), sometimes called online communities, describe the mediated social spaces in the digital environment that allow groups to form and be sustained primarily through ongoing virtual communication processes (Bagozzi and Dholakia 2002). Much evidence has shown their potent influence in bringing together far-flung, like-minded individuals (Hagel and Armstrong 1997) and their commercial and/or social values (Gupta and Kim 2004). Identification, among other factors, has been demonstrated to be an important social influence exerted from a collective body (in this case, VCs) to motivate VC participation and sustainability of a VC (Bagozzi and Dholakia 2002, Dholakia *et al.* 2004, Kankanhalli *et al.* 2005, Ren *et al.* 2007, Nambisan and Baron 2010). It has been suggested that member identification with the VC will enhance the value of the perceived benefits from the community, and therefore, encouraging participation (Dholakia *et al.* 2004, Shen *et al.* 2010, Pai and Tsai 2011).

Despite the importance of identification in VC sustainability, very few studies have investigated how to develop members' identification in the VC context and particularly the effects of VC design on identification development. To date, most research on identification formation has been done in formal organisations (e.g. Dutton *et al.* 1994, Bhattacharya *et al.* 1995, Dukerich *et al.* 2002, Bhattacharya and Sen 2003) and focuses on theoretical development, providing little empirical evidence (Foreman and Whetten 2002). Even though a few studies have explored the notion of identification with physical communities, the basis for identification arises from geographical proximity (Puddifoot 1995) and/or members' relational connections (Brodsky and Marx 2001), which may not be applicable in the contexts of VCs where strangers communicate in a distributed environment. Most prior studies on VCs only incorporate identification or social identity as an antecedent (e.g. Dholakia *et al.* 2004, Kankanhalli *et al.* 2005, Ma and Agarwal 2007) or moderator (e.g. Nambisan 2002) to explain members' participation. We still lack the understanding of how identification with a VC develops in general, and the impacts of VC design in particular.

Thus, in this study, we seek to fill the theoretical gaps by developing and empirically testing a model that explains identification formation in the VC context in general and the role of VC design factors in particular. VC design refers to both the technical and social decisions that a VC management team, consisting of administrators and moderators, adopt to influence members' interactions in the VC (Ren *et al.* 2007). Particularly, we identify both technical and social VC design factors that are relevant to identification development. Community presentation reflects the technical design choices to present and communicate VC identity to its members; while empowering community embodies the social design choices pertaining to VC identity communication. Since identification stems from a member's assessments of the fit between his or her categorisations of the organisation and his or her self-categorisation (Foreman and Whetten 2002), we develop the research model by

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adopting a comparison approach developed in studying formal organisational identification (Dukerich *et al.* 2002) to the VC context. We argue that VC design will encourage members to identify with the VC by influencing the assessment of the VC identity as perceived by members.

The article is organised as follows. First, we briefly review the relevant research and discuss the adaptation of existing theories in the context of VCs. This is followed by the discussion of the VC design factors and their effects on identification development. Then, we report the empirical study and discuss the results. Finally, we conclude the article with theoretical and practical implications as well as the future research directions.

2. Self-categorisation theory and identification in VCs

According to self-categorisation theory (Turner 1985, Turner *et al.* 1987), the social categorisation of self is a cognitive process where the self is assimilated to the in-group prototype and depersonalises self-conception. Once identified with a social category, the individual tends to define him- or herself in terms of the defining features of the social category, which renders the self stereotypically 'interchangeable' with other group members, and stereotypically distinct from outsiders (Hogg and Abrams 1988). Accordingly, Ashforth and Mael (1989) define identification as the 'perception of oneness with or belongingness' to the social category, which stems from a member's assessments of the fit between his or her categorisations of an organisation and his or her self-categorisation (Foreman and Whetten 2002). A comparison approach is therefore employed in prior studies in the context of formal organisations. According to Dutton *et al.* (1994), perceived organisational identity conceptualised as an individual-level construct refers to the beliefs of a particular individual member in an organisation and helps individuals understand the question: 'what does this organisation stands for?' (Dukerich *et al.* 2002). While perceived organisational identity may be highly correlated with organisational identity, an organisational-level construct – the two constructs are conceptually distinct. Moreover, due to the fact that it is always difficult to perfectly socialise members to a collective view, what are perceived by particular members as central, distinct and enduring attributes may not be consistent with what managers want to convey. A perceived organisational identity is viewed as attractive when it fulfils the needs for self-continuity, self-distinctiveness and self-enhancement, and the attractiveness of perceived organisational identity leads to strong organisational identification (Dukerich *et al.* 2002).

Such a comparison approach assumes the existence of an organisational identity with which members can assess and identify. Do VCs have a 'VC identity' with which members can identify? Prior literature on organisational identity has provided two competing perspectives that can shed light on VC identity. Identity-as-shared perceptions among members view organisations as social aggregates (Hogg and Terry 2001); while identity-as-institutionalised claims available to members view organisations as social actors authorised to engage in defining and institutionalising organisational identity (Czarniawska 1997).

In the context of VCs, both these perspectives are applicable as they imply two relevant sources to define or derive VC identities. On one hand, VCs can be viewed as social aggregates based on shared interests. The observation of in-group member actions gives rise to spontaneous inference of norms or conventions about 'who we are as a collective' (Postmes *et al.* 2000). Thus, a VC identity can be conceptualised as a set of shared beliefs derived from the interactions of individuals in the VC, which are central, enduring and distinctive (Hunt and Benford 2004). On the other hand, VCs also share some similar institutional characteristics with organisations. Management team members may actively engage in developing specific policies to regulate members' behaviour, encourage social interaction and define VCs' themes (Preece 2000). In order to attract new members and keep members' on-going participation, they also seek ways to promote VCs through advertisement, unique system design, various offerings to members and guiding community interaction to align with themes. All such institutionalised practices and binding community commitments signify the existence of VC identities as institutional claims (Whetten and Mackey 2002).

Either way, the communication of VC identities is less controllable than that in an organisation due to the informal nature of the organisation and voluntary participation. Members have full flexibility in choosing topics, discussion boards and partners for interaction. Consequently, imperfect socialisation may be more salient and members may vary significantly in the evaluation of VC identities. Despite the differences, members join VCs to fulfil similar needs, e.g. understanding and deepening salient aspects of one's self through social interaction (Dholakia *et al.* 2004), and seeking self-esteem (Baumeister 1998). As with perceived organisational identity, members assess the attractiveness of the perceived VC identity by how well this image helps maintain the continuity of self-concepts, provides distinctiveness and enhances self-esteem. To the extent that the members' perception of VC identities is correspondent with their goals and values, i.e. attractiveness of perceived VC identities increases, they are more likely to develop identification with the VC. Therefore, we hypothesise that:

H1: The more attractive perceived VC identities, the higher identification with the VC.

3. VC design: community presentation and empowerment

VC management teams, consisting of administrators and moderators who construct and maintain the community,

are institutional forces in VCs. As implied by 'identity-as-institutionalised claims', VC management teams play an active role in shaping and communicating VC identities via various technical and social choices, which are referred to as VC design (Ren *et al.* 2007).

Community presentation is proposed to denote technical choices in VC design and is defined as the extent to which a VC makes use of the website design features to communicate VC identity as defined by VC management teams. Here, the website features are website configuration and design that signalling VC identity constituents. Some features help mark the boundary of a VC by presenting the demographics of a VC and differencing it from others, e.g. total number of members, community logo, theme and unique interface design. 'If content is king, then look is queen'.[1] In an online poll with VC administrators, about 60.71% think design is very important for a forum and particularly a 'unique and nice' design is preferred. The other features enhance the awareness of community by communicating the community activity statistics to their members. Based on a belief elicitation among administrators, we identified the typical features that VC designers use to establish a VC as a viable and meaningful social category in members' minds by answering questions such as 'what does this VC stand for?' and 'how is this VC different from others?', including logos and symbols, statement of purposes, membership policies, community initiatives and promotion, presentation of management teams, interaction states of the VC, demographic features (e.g. size, active members, postings, etc.), unique interface design and unique functionality design. Such community presentation is especially relevant in VCs that are purely online where perceived legitimacy is often the lowest (Fiol and O'Connor 2005).

When community presentation can convey a very unique and clear VC identity, the chance for members to access the VC identity is high. The enhanced social identity salience (in this case, a VC identity) will trigger the associated process of self-stereotyping which has the capacity to consensualise beliefs within a given in-group by (1) enhancing the perceived homogeneity of that in-group; (2) generating associated expectations of agreement with other group members on issues relevant to the shared identity and (3) producing pressure to actively reach consensus in dealing with those issues through mutual influence (Oakes *et al.* 1994, Haslam *et al.* 1999). When community presentation makes a VC identity salient by highlighting its in-group homogeneity and outlining its uniqueness, the members of this VC are more likely to develop a more favourable attitude towards the perceived VC identity. Thus, we hypothesise that:

H2: the more access to community presentation features, the more likely the members perceive VC identity as attractive.

Social choices of VC design, on the other hand, involve structures, policies and practices within a VC, e.g. membership structure, content moderation, etc., with a purpose to construct an environment that empowers members and encourages participation (Ren *et al.* 2007). In this research, *Community Empowerment* is proposed to refer to the extent to which a VC makes use of structures, policies and practices in supporting member empowerment. Community settings vary in their capabilities to empower members. Maton and Salem (1995), based on a multiple case study with three physical communities, identify organisational characteristics across diverse types of empowering community settings, including (1) a group-based belief system that defines community's ideology or values; (2) an opportunity role structure that is pervasive, highly accessible and multifunctional; (3) a support system that is encompassing, peer-based and provides a sense of community and (4) leadership or the key individuals who are inspiring, talented, shared and committed to both setting and members. These characteristics are not only applicable in physical settings but also applied by VC practitioners in constructing and maintaining VCs. For instance, GirlsGetGoing.com, officially launched on 1 February 2006, is a 'women's motivational website, created for friendship, inspiration and healthy living', which clearly specified the ideology or goal of this VC. Moreover, this VC was centred on the concept of incentives, in the form of profile badges for accomplishing goals, which corresponds to the role structure in Maton and Salem (1995). Finally, this VC enjoyed a committed management team and role models in various challenges were highlighted to motivate the engagement of others.

Although the ultimate goal of community empowerment is to empower members and encourage participation, community empowerment captures the major aspects of social design of VC with regard to VC identity communication. This is because all the defining features of an empowered community are the referents of VC identity, e.g. belief system and core individuals, contributing to the content of VC identity, informing members about 'who we are' and 'what we do'. Furthermore, the empowering characteristic, per se, can also be considered as VC identity.

Community empowerment fulfils the members' needs for self-enhancement and self-distinctiveness. Particularly, a belief system that can empower members should address the members' needs and potential and inspire growth (Maton 2008). It provides the momentum for members to develop and change, which is consistent with the need for self-enhancement. Similarly, an opportunity role structure provides meaningful opportunities for participation, learning and development for members and a supporting system encompasses the quality and nature of interpersonal relationships, which reduces the threshold for members, particularly new comers, to navigate through information traffic and to understand community norms (Ren *et al.* 2007). Finally, leadership refers to the quality of the key individuals with formal and/or informal responsibilities for a community (Maton 2008). In the VC context, such individuals are usually frequent and loyal posters, performing a large proportion of community building, maintenance and

moderating the VC (Ren *et al.* 2007). To a large extent, their talented and committed activities symbolise the VC identity and also attract others to the VC. Thus, since members may vary in their exposure to the characteristics of empowering community, in this study, we employ perceived community empowerment as an individual-level construct that refers to the beliefs of a particular VC member regarding the extent to which a VC exhibits the characteristics of community empowerment; and serves as a powerful influence on the degree to which the members perceive the VC identity as attractive.

H3: The stronger the perceived community empowerment, the more likely the members perceive VC identity as attractive.

4. Empirical study

The research model was validated with an online survey study. Before that, a pilot test was conducted with 80 respondents from three VCs for validating the measurement. Although some researchers claim that online surveys have unavoidable disadvantages, e.g. response bias, the advantages are more salient since this mode fits the objective of this research, which is to understand identification in the real setting. With an online survey, the respondents will not be distracted from their familiar environments while completing the survey.

4.1. Data collection

To enhance external validity, multiple VCs were selected for empirical study. The cultural and language differences were controlled by selecting the English forums only. The data for this study were collected from 7 VCs with a wide range of topics and a large variance in community size (Table 1).

Data collection for the main study lasted two weeks. There were 412 respondents in total. The response rate was estimated, based on the actual exposure of the survey in each forum which considered: (1) daily unique members; (2) members' frequency of login as inferred from the responses and (3) difference in survey exposure. The estimated response rate ranged from 10% to 33%. Tables 2 and 3 report the demographic information of the whole sample and the mean values for each VC. ANOVA reported significant group difference in terms of gender, tenure and

Table 1. Profile of VCs.

Name of VC	Duration (year)	Size[a] (registered members)	Daily unique members	Topic
VC1	6	4056	60	Literature
VC2	5.5	4060	40[b]	Transformers
VC3	6.5	24,800	198[b]	IT
VC4	4	195,230 (3152)	87[b]	Railroad simulator
VC5	7.6	32,542	30	Football community
VC6	5.5	2562	160	Hacking
VC7	5	83,022 (12,027)	103[b]	PC Hardware

[a]The number of total registered members at the time of the survey.
[b]Estimated number based on observation.

Table 2. Demographic information (total sample).

	Items	Frequency (%)
Gender	Female	13.6
	Male	86.3
Age	<20	21.8
	20–30	43.9
	>30	34.2
Tenure	Less than 1 year	19.9
	1–2 year	22.3
	3–4 year	27.7
	≥5 year	21.4
	Missing	8.7
Frequency of the visit	More than once a day	58
	Once a day	25.7
	At least once a week	12.6
	At least once a month	3.6
Status in the VC	Member	91
	Moderator	5.8
	Administrator	3.2
Number of other VCs with similar themes (parallel VCs)	Never	12.4
	1	22.3
	2	23.5
	3	18.7
	More than 3	23.1

Table 3. Demographic information by VC.

	VC1	VC2	VC3	VC4
Gender	1.39	1.13	1.20	1.01
Age group	2.37	1.96	2.07	2.77
Tenure	2	3	3.05	3.17
Frequency of the visit	1.65	1.41	1.53	1.62
Status	1.08	1.07	1.05	1.05
Other forums	1.55	2.63	2.04	2.38
	VC5	VC6	VC7	
Gender	1.14	1.08	1.03	
Age group	2.38	1.38	2.07	
Tenure	2.18	2.30	3.46	
Frequency of the visit	2.05	1.69	1.55	
Status	1.14	1.41	1.08	
Other forums	2.19	2.10	2.38	

Notes: Gender: 1 = male; 2 = female; age group: 1 =< 20; 2 = 20 − 30; 3 => 30. Tenure: 1 = less than 1 year; 2 = 1 − 2 years; 3 = 3 − 4 years; 4 => 5 years; 0 = missing. Frequency of the visit: 1 = more than once a day; 2 = once a day; 3 = at least once a week; 4 = at least once a month. Status: 1 = member; 2 = moderator; 3 = administrator; other forums: 1 = never; 2 = 1; 3 = 2; 4 = 3; 5 = more than 3.

the number of parallel VCs. Most respondents were male, which was consistent with the general profile of the VCs. The response bias was addressed through comparing all variables from the early and late responses in the main study within each VC (Oppenheim 1966). The results of *t*-tests for the demographic profiles, community tenure, identification, etc., were not significant.

4.2. Measurement (Appendix 1)

Identification was measured with the most widely used scale developed by Mael and Ashforth (1992) and used in Dukerich *et al.* (2002). Prior literature suggests two approaches to measure attractiveness of perceived organisational identity. The first approach is calculated from the evaluation of each perceived organisational identity (e.g. Dukerich *et al.* 2002). This method requires respondents to explicate the perceived organisational identity and then rate the extent to which each identity is perceived as attractive. Bhattacharya and Sen (2003) suggested another way by using reflective items to measure attractiveness. As the first method requires a lot of cognitive effort and is more time consuming, which may reduce the response rate, the reflective measures are favoured. In the pilot study, both measures were included. The high correlation of 0.98 ($p < .01$) also guaranteed the equivalence between these two measures for this study. In the main study, the three reflective items were included, and the respondents were asked to rate their perception of VC identities in terms of attractiveness.

Measures for community presentation and community empowerment were developed for this study as there is no existing scale for this variable, with community presentation using formative measures and community empowerment using reflective measures. With reflective measures, the underlying latent construct causes the observed variation in the measures (Bollen 1989), implying the covariation of items and assuming the direction of causality to be from the latent variable to its measures. The items are congeneric indicators tapping into a latent first-order factor. In contrast, formative measurement assumes causality flowing from the measures to the latent construct, where the indicators jointly determine the conceptual and empirical meaning of the construct (Bollen 1989). The items form the emergent first-order factor. The use of formative measurement items enables the assessment of the significance and relative importance of the distinct dimensions, active control, communication and synchronicity.

Formative measures were used for community presentation as selection of specific technical features could be independent. Based on a belief elicitation among administrators, we identified the typical features that VC designers use to establish a VC as a viable and meaningful social category in members' minds by answering questions such as 'what does this VC stand for?' and 'how is this VC different from others?'. The resulting items were then corroborated with the constituents of organisational identity (Bhattacharya and Sen 2003) to determine the relevance.

The measurement for community empowerment was developed based on the characteristics of community empowerment identified in Maton and Salem (1995). Different from community presentation, community empowerment involves social rules and choices that can be directly designed (such as belief system and role structure) or indirectly manipulated (such as social support and acting as role models) by the VC management team. The initial four defining characteristics are identified to reflect 'empowerment', in community contexts. The examination of the four components of community empowerment reveals that these components are likely correlated in order to convey a coherent VC identity. This is mainly because VC management teams are not alienated from the rest of the members, but likely the most committed participants in VCs. On the one hand, they outline the social rules and define the role structure; on the other hand, they are also the ones to practice such social rules and become inspirations and social support for the others. According to Bollen and Ting (2000), Diamantopoulos and Winklhofer (2001) and Finn and Kayande (2005), empirical examination is also necessary to design and validate measurement models. We also perform the factor analysis for each VC. For all VCs, the items for community empowerment loaded on one factor, providing the empirical support for a reflective model.

The formative measures were tested and validated in the pilot test according to criteria suggested by Diamantopoulos and Siguaw (2006). Particularly, the multicollinearity among these items was first examined. High levels of multicollinearity in a formative measure can be problematic because the influence of each indicator on the latent construct cannot be distinctly determined (Bollen 1989, Law and Wong 1999). Using a 0.3 tolerance level as the cut-off criterion (Diamantopoulos and Siguaw 2006), two items were removed for community presentation. Next, the formative items were checked to ensure that they still exhibited sufficient breadth of content to capture the domain of the respective constructs.

Two controls were included in the survey. The first one is community tenure, as Mael and Ashforth (1992) indicate, the length of time a person is actively involved with an organisation is positively related to identification. The second control is offline activities. The examined VCs were launched as purely online forums, with members also getting involved in some offline activities, which may have affected identification. Items adapted from Koh and Kim (2003) and Ma and Agarwal (2007) were used to measure offline activities.

4.3. Data analysis

Since the data were collected from several VCs, it was necessary to ensure the homogeneity in measurement and the

structural model before pooling together the data from different sites. Therefore, a series of group invariance tests were conducted with AMOS 5.0, following the procedure derived from Joreskog (1971). Those groups with invariant measurement loadings and structural variance were pooled together for the model testing.

In this research, we used partial least squares (PLS) for model testing for the following reasons. First, PLS is widely accepted as a suitable technique for testing theories in the early stage or exploratory model testing, while the other methods such as LISREL is usually used for theory confirmation (Fornell and Bookstein 1982). Second, formative measures were used in this research. Although the other covariance-based methods can accommodate formative indicators, specific constraints on the model are necessary to ensure model identification (Diamantopoulos and Riefler 2008, Bollen and Davis 2009). These constraints often contradict theoretical considerations, leading to the problem whether model design should guide theory or vice versa. However, variance-based PLS can handle formative indicators directly without the above issue (Fornell and Bookstein 1982). Third, some of variables in this research are not normally distributed, but the normality of the survey data will not influence the PLS results. This is because re-sampling techniques used in PLS establish confidence intervals based not on assumptions, such as multivariate normal distributions, but on repeated samples from the researcher's own data. More recently, Reinarzt *et al.* (2009) showed that PLS achieves high levels of statistical power—in comparison to its covariance-based counterpart – even if the sample size is relatively small.

Tests of significance were conducted for all paths using the bootstrap re-sampling procedure and the standard approach for evaluation that requires path loadings from construct to measures to exceed 0.70. Internal consistency of reflective measures was checked with composite reliability measures (ρ) and average variance extracted (AVE), as suggested by Fornell and Larcker (1981). The discriminant validity was examined by comparing the square root of the AVE for a particular construct to its correlations with the other constructs (Fornell and Larcker 1981) and by examining cross-loadings of the constructs.

Common method variance was addressed by Harman's single-factor test (Podsakoff and Organ 1986) and the procedure suggested by Lindell and Whitney (2001). First, no dominant factor emerging from the factor analysis was found, and the first factor only accounted for 11% of the variance, implying that common method variance was not a serious problem. Second, we incorporated a marker variable to detect and partial out variance due to the common method (Lindell and Whitney 2001). After adjustments with the common method variance, the partial correlations among variables in the research model were still high and significant, suggesting that the common method variance cannot account for these correlations.

5. Empirical results and discussion

With AMOS 5.0, we followed the procedure as suggested by Joreskog (1971) to check the group variance before pooling data from different VCs. Due to the software limitation, only three latent variables with reflective measures were examined, i.e. attractiveness, identification and community empowerment. All VCs were found invariant in both the measurement model (ΔDF = 66; ΔCMIN = 58.862; $p = .721$) and the structural model (ΔDF = 102; ΔCMIN = 101.034; $p = .508$). We further confirmed the group invariance for the full model by using the 'multi-group analysis' (Chin 2000), whereby the same model is compared for seven different VCs. The basis for comparison is coefficients generated by PLS, including path coefficients and their standard errors.[2] The results indicated invariance in terms of path coefficients among all VCs.

5.1. Measurement model

As both reflective and formative measures were used in this study, two sets of tests were conducted. The measurement validity and the reliability for reflective measures were examined with factor analysis and PLS analysis. The formative measures were checked, based on the criteria suggested by Diamantopoulos and Winklhofer (2001).

Table 4 reports the descriptive statistics and the reliability for reflective measures. One concern with online surveys is the selection bias, that is, only highly identified members choose to participate, creating the ceiling effect. The data indicate that the rating of respondents' identification was around the mean with reasonable variance. Thus, it is less likely that the respondents were dominant with highly identified members.

The results of a factor analysis (Table 5) indicate that the items were loaded distinctively on their respective constructs, providing preliminary support for the convergent and discriminant validity.

Table 6 presents the loadings of the reflective measures to their respective constructs along with composite reliability scores, standard errors and *t*-statistics, resulting from the PLS analysis. All reflective items were significant at the 99% level with high loadings (all above 0.70 and most above 0.80), therefore demonstrating convergent validity. The composite reliability scores (ρ) of all latent constructs were higher than the recommended value of 0.80 (Nunnally 1978), demonstrating internal consistency. Table 6 also includes the weights of the formative items. Weights can be interpreted in a manner similar to beta coefficients from a multiple regression (Chwelos *et al.* 2001), which will be discussed further in the structural model.

Table 7 presents the discriminant validity statistics. The square roots of the AVE scores (diagonal elements of Table 7) were all higher than the correlations among the constructs, demonstrating discriminant validity. Furthermore, all items were loaded higher on their respective

Table 4. Descriptive statistics and reliability for reflective measures.

	VC1				VC2			
	Mean	Std.	Cronbach's α	Jöreskogs ρ	Mean	Std.	Cronbach's α	Jöreskogs ρ
Identification	3.43	2.18	0.78	0.90	3.54	2.21	0.77	0.93
Attractiveness	4.36	0.86	0.80	0.93	4.13	1.02	0.85	0.96
Community empowerment	3.29	0.87	0.82	0.87	3.61	0.98	0.89	0.92
	VC3				VC4			
	Mean	Std.	Cronbach's α	Jöreskogs ρ	Mean	Std.	Cronbach's α	Jöreskogs ρ
Identification	4.13	2.08	0.88	0.94	3.61	2.1	0.84	0.93
Attractiveness	4.36	0.87	0.85	0.95	4.25	0.91	0.89	0.93
Community empowerment	3.98	0.66	0.78	0.84	3.47	1.03	0.89	0.92
	VC5				VC6			
	Mean	Std.	Cronbach's α	Jöreskogs ρ	Mean	Std.	Cronbach's α	Jöreskogs ρ
Identification	2.3	1.9	0.87	0.91	3.78	2.29	0.83	0.93
Attractiveness	3.72	1.12	0.88	0.92	4.08	1.1	0.90	0.92
Community empowerment	2.64	0.82	0.76	0.82	4.25	0.67	0.80	0.83
	VC7							
	Mean	Std.	Cronbach's α	Jöreskogs ρ				
Identification	3.75	1.98	0.83	0.93				
Attractiveness	4.35	0.84	0.88	0.94				
Community empowerment	3.67	0.87	0.72	0.91				

Table 5. Factor analysis for reflective measurement.

		1	2	3
Attractiveness of Perceived VC Identity	Item1	.179	.213	**.814**
	Item2	.221	.129	**.865**
	Item3	.242	.111	**.847**
Community empowerment	Item1	.307	**.681**	.100
	Item2	.280	**.724**	.189
	Item3	.193	**.753**	.046
	Item4	.139	**.613**	.454
	Item5	.163	**.703**	.387
	Item6	.185	**.594**	.455
Identification	Item1	**.833**	.123	.164
	Item2	**.818**	.087	.251
	Item3	**.838**	.170	.242
	Item4	**.716**	.173	.237
	Item5	**.712**	.193	.158
	Item6	**.758**	.280	.139

Note: Bold correlated values are significant at 99%.

Table 6. Measurement model.

	Weight	Loading	t-Test	VIF
Community presentation				
Informing the overall participation level	0.27**		1.65	1.427
Informing external associations	0.25**		1.88	1.247
Distinct interface	0.31**		1.67	1.375
Informing the main events	0.20		1.11	1.447
Distinctive logo/name	0.36***		2.06	1.603
Attractiveness	$\rho = 0.940$; AVE = 0.839			
Item1		0.87	44.95	
Item2		0.94	114.67	
Item3		0.93	82.31	
Identification	$\rho = 0.930$; AVE = 0.688			
Item1		0.84	44.61	
Item2		0.84	48.24	
Item3		0.89	60.94	
Item4		0.80	33.78	
Item5		0.80	41.04	
Item6		0.82	47.27	
Community empowerment	$\rho = 0.891$; AVE = 0.578			
Item1		0.67	7.47	
Item2		0.75	10.62	
Item3		0.65	7.23	
Item4		0.86	25.68	
Item5		0.84	22.33	
Item6		0.78	16.89	

***$p < .01$.
**$p < .05$.
*$p < .1$.

constructs than on others, providing additional support for discriminant validity.

5.2. *Structural model results and hypothesis testing*

Figure 1 presents the results of the PLS analysis of the structural model for two groups, including the overall explanatory power (R^2) and path coefficients (for relationships between latent variables). Overall, the results provide a strong support for the research model.

These results confirm the applicability of Dutton *et al.*'s (1994) theory in the context of VCs and the effects of VC design on identification with a VC. The effect of the attractiveness of the perceived VC identities on identification was found to be significant (path coefficient =

Table 7. Discriminant validity of reflective measures.

	Attractiveness	Identification	Community empowerment
Attractiveness	**0.916**		
Identification	0.456	**0.830**	
Community empowerment	0.603	0.560	**0.760**

Note: Bold correlated values are significant at 99%.

0.409; $p < .01$), supporting H1. Together with the control variables, the model explained 21% of the variance in VC identification. So were the effects of both community presentation (path coefficient = 0.393; $p < .01$) and community empowerment (path coefficient = 0.344; $p < .01$) on attractiveness of perceived VC identities, supporting H2 and H3. Both factors explained 48.5% of the variance in attractiveness of perceived VC identity, suggesting that VC design plays an important role in communicating VC identity and developing VC identification.

A number of VC identity constituents can be presented, but their effectiveness in terms of enhancing identification might not be equal. The most important two measures to present VC identities were designing a distinctive logo/name (weight = 0.36; $p < .01$) and a distinct interface (weight = 0.31; $p < .05$). Although most VCs adopted similar software packages, they can still be differentiated from each other by putting on different faces, which is also a main factor affecting the members'/visitors' perception of the VCs. Moreover, informing members of the overall participation level (weight = 0.27; $p < .05$) and the external associations (weight = 0.25; $p < .05$) were also reported

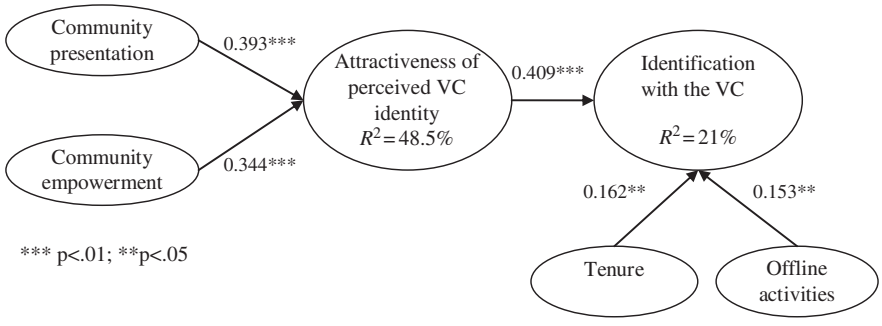

Figure 1. Structural model results.

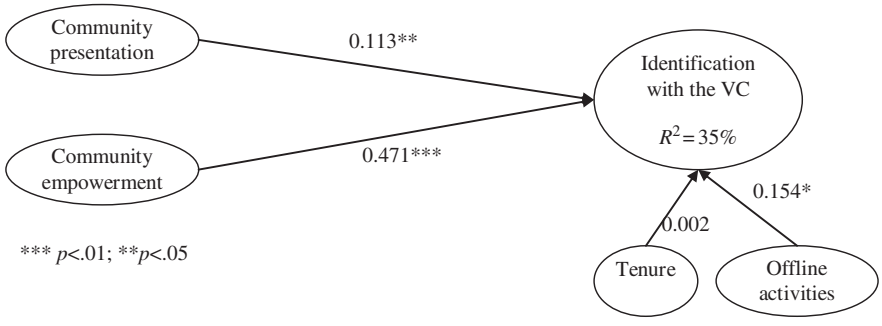

Figure 2. Structural model results: direct effects of VC design.

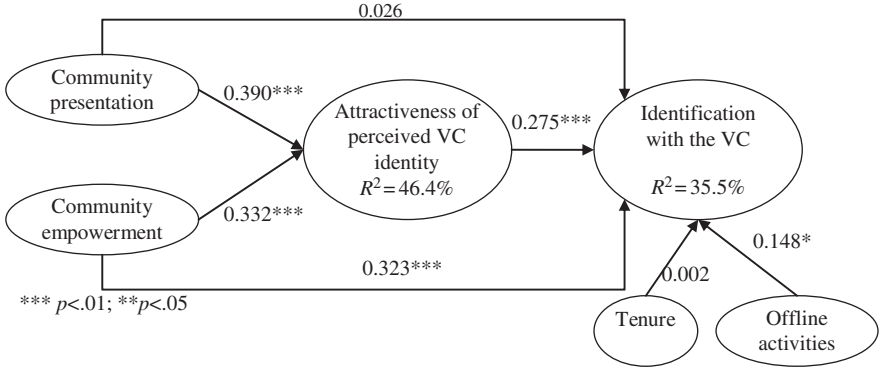

Figure 3. Structural model results – full model with direct effects.

to be significant in inducing a favourable assessment of VC identity. This implies that the level of overall participation is a main constituent of VC identities. Members are more likely to identify with an alive community, where there is a better chance of having their needs for self-esteem, self-distinctiveness and/or self-continuous met.

Finally, we also employed the procedure suggested by Sobel (1982) and Baron and Kenny (1986) to test the mediating effects. The significant mediation of the attractiveness of the perceived VC identity was strongly supported for the effect of community presentation (Sobel *test* = 3.46; $p < .01$) and empowering community (Sobel test = 3.6; $p < .01$). Specifically, the results show that the attractiveness of the perceived VC identity fully mediated the effect of community presentation while its mediating effect was only partial for community empowerment (Figures 2 and 3). It seems that the effect of community empowerment identification is not only channelled through making the perceived VC identities more attractive. This suggests that some other alternative mechanisms may exist in addition to the identity comparison process in developing VC identification, which warrants further investigation.

6. Conclusion and implications

Prior research has demonstrated that identification viewed as an important social influence exerted from a collective body (in this case, VCs) influences members' group behaviour (Bagozzi and Dholakia 2002, Dholakia *et al.* 2004, Kankanhalli *et al.* 2005, Ren *et al.* 2007, Nambisan and Baron 2010). However, despite its importance, our understanding about how to develop members' identification in the VC context and particularly the effects of VC design on identification development remains limited. In this study, we fill the research gap by conceptualising and validating a research model on identification formation in the VC context. Overall, the results provide a strong support for our theoretical perspectives. Particularly, the findings show a strong support for the comparison approach in developing identification. Moreover, the significant effects of community presentation and community empowerment also demonstrate the importance of VC designers/managers in presenting and communicating VC identities by leveraging both technical and social design choices.

6.1. Theoretical implications

Identification has been studied in many contexts, e.g. groups, organisations, communities, and more particularly, VCs. However, most prior research on organisational identification has focused on theoretical development, which has received little empirical validation (Foreman and Whetten 2002). In the context of physical communities, studies on identification have just started and many controversies remain in several fundamental areas, such as the existence of community identities. In the IS field where VCs have received much interest, most prior studies take identification or theories developed in organisational contexts as given without examining its formation due to VC design factors. This study advances the theoretical work on identification by conceptualising VC identities, developing and empirically testing a research model to explain identification formation in VCs. Particularly, our theory and results have demonstrated the role of VC design in developing identification with a VC. The current study also contributes to the literature of identification in general by extending organisational identification theories to VC contexts and accounting for the role of individuality expression in identification.

Our results confirm the applicability of the comparison approach in understating identification as developed in formal organisational contexts. Most prior VC research focuses on the voluntary behaviours by individual members in sustaining a VC. While community forms of organising have been increasingly considered by many companies, little is known about how such communities producing collective goods govern, organise and coordinate themselves (O'Mahony and Ferraro 2007). In practice, VC designers and managers are actively involved in launching, sustaining, promoting and even commercialising VCs. Their efforts, as reflected through the VC design, should be considered as an important factor in understanding VC-related phenomenon. The current study demonstrates that the lack of formal structure does not prevent VC designers/managers from instilling the VC identity-as-institutionalised claims, and thus brings forward the institutional activities in VC contexts. Community presentation and empowering community are proposed to capture the technical and social design choices in order to enhance the attractiveness of perceived VC identity. Our results demonstrate that such institutional effort plays an important role in developing identification among members by influencing the assessment of the VC identity as perceived by members. Particularly, effective community presentation can enhance cohesiveness within a VC and highlighted distinctiveness provides additional motivation for members to adopt the VC identity in their self-views, which leads to high engagement. Moreover, VC designers/managers need to create an empowering community that enables a shared ownership and authority among members. In this way, members are more likely to identify with the VC.

6.2. Practical implications

Apart from the rich theoretical implications, this study also suggests multiple interventions and associated IT artefacts that VC designers and managers can employ for VC identification. Firstly, the significant role of community presentation in enhancing the attractiveness of the perceived VC identities suggests the importance to have a 'good look'

that should clearly communicate the meaning of the presented VC and distinguish it from other VCs. Particularly, for lurkers and visitors who seldom contribute to the content of a VC, community presentation forms the basis for them to develop identification with the VC and their participation in forms of reading also contributes to the community as a whole. In addition to the 'look', an effective community presentation is also achieved through informing members of the community active level, e.g. number of active members, new posts, new titles, etc. Such information signals the value of a VC for members, e.g. sense of belonging, social capital, reorganisation and/or self-verification.

Moreover, VC designers/managers need to create an empowering community to instill a shared ownership of a VC among members. A clearly defined belief system should reflect members' needs, problems and potential, and therefore, participation or association with the VC will become more relevant for members. Secondly, an opportunity role structure that provides opportunities for individuals to develop, grow and participate should be available and easy to comprehend. For instance, a role structure can be defined to reflect members' on-going contribution or members are encouraged to run for different positions for moderating and running the VC. In addition, the VC should provide social support resources that are particularly important to socialise new comers (Ren *et al.* 2007). It is also necessary to identify key actors in a VC and make them visible to other members. Such actors could be talented and have expertise respected by the others, or role models consistent with VC identities, or strongly committed members. Their behaviour and contribution will inspire the rest to follow and substantiate what the VC stands for. The following comment by one participant may be a good illustration:

> VC2 is a great community. Lots of intelligent people who have strong beliefs and values contribute to making it a great place to visit and hang out. Most of the board is friendly, so when you do meet someone unfriendly, you don't really feel overwhelmed.

6.3. Limitations and future research

There are some limitations to this study that imply interesting and fruitful further research and are thus noteworthy. Firstly, although the selection of real VCs that vary in topic, purpose, size and gender composition helps enhance the external validity, generalisations to other VCs still need to be made cautiously. Especially, with different technical affordances (e.g. Facebook communities), the VC identity constituents that need to be communicated through website configuration and design may vary, and this may influence how community presentation should be operationalised and measured. In addition, while this research highlights the content objectives (enhancing VC identity accessibility) of VC technical design, the future research could also extend to examine the communication means for such objectives since the same VC constituents could be communicated through different channels (e.g. email alert, website, etc.) by using different modes (e.g. synchronised vs. asynchronised, one-to-many vs. many-to-many). Such research will provide a more comprehensive picture of various roles that technical design could play in developing VC identification. Secondly, identification examined in this study focuses on the identification with the VC. However, it is possible that members' identification was based on the perception of sub-groups, e.g. boards. Although the perceived VC identities and the measures for identification emphasised the overall VCs, it would be useful to incorporate the identification with sub-groups in future studies. Thirdly, one of the general concerns of using an online survey and voluntary participation may be the possibility for selection bias. Although the data demonstrated acceptable response rates and reasonable variance in major variables, it would be preferred if we could compare the participants with non-participants in order to provide some direct evidence regarding selection bias. Fourthly, at an exploratory stage, this study only applies the comparison approach in understanding VC identification. However, the partial mediating effect of attractiveness of perceived VC identities on the link between community empowerment and VC identification suggests the existence of alternative mechanisms, in addition to identity comparison approach, in developing VC identification. Finally, the cross-sectional design of this dissertation implies that no causation can be determined. The significant paths between constructs can only be interpreted as correlation and the causal inferences are solely based on theoretical argumentation. Thus, future research is recommended to adopt a longitudinal approach to provide even more convincing evidence for the role of website design in members' identification development.

Notes

1. http://www.theadminzone.com/forums/showthread.php?t=17704&page=4
2. The discussion of "multiple group analysis"is available at http://disc-nt.cba.uh.edu/chin/plsfaq/multigroup.htm

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Appendix 1. Operationalization of constructs

Community Presentation (1 = not at all; 5 = very much)

1) The forum informs me of the level of participation.
2) The forum informs me of its external relationships (e.g., associations with the other forums or websites).
3) The forum has a distinct interface from the other forums with a similar theme.
4) The forum informs me of the main events.
5) The forum has a distinct logo/name.

Community empowerment (1 = strongly disagree; 7 = strongly agree)

1) This forum has a clearly defined belief system, which reflects members' needs, problems and potential.
2) This forum has an opportunity role structure that provides opportunities for individuals to grow and participate.
3) This forum is able to offer social support resources.
4) People responsible for this forum are inspiring and talented.
5) People responsible for this forum are represented by role models sharing their experiences.
6) People responsible for this forum are committed to the forum.

Attractiveness of Perceived VC Identities
Method 1: (Dukerich *et al.* 2002)
Below are 5 fill-in-the-blank areas for you to answer the question "what does the forum stand for?" Simply type in an answer next to the numbered item and make each answer different (e.g., activist, best, democratic, innovative, etc.). Answer as if you were giving the answers to yourself, not to somebody else. Write the answers in the order that they occur to you. There are no right or wrong answers. Then for each response, please indicate how it is attractive for you.

1) I perceive this forum as _____
   Please rate how attractive is it? (−3 = not at all attractive; +3 = very attractive)
2) I perceive this forum as _____
   Please rate how attractive is it?
3) I perceive this forum as _____
   Please rate how attractive is it?
4) I perceive this forum as _____
   Please rate how attractive is it?
5) I perceive this forum as _____
   Please rate how attractive is it?

Method 2: Reflective Measures (Sen and Bhattacharya 2001; Bhattacharya and Sen 2003). Please read the following statements and indicate to what extent you disagree or agree with them.

1) I like what this forum stands for.
2) This forum has an attractive identity.
3) I think this forum's identity is attractive.

Identification (Mael and Ashforth 1992) (1 = strongly disagree; 7 = strongly agree)

1) When someone criticizes this forum, it feels like a personal insult.
2) This forum's successes are my successes.
3) When someone praises this forum, it feels like a personal compliment.
4) I'm very interested in what others think about this forum.
5) When I talk about this forum, I usually say "we" rather than "they".
6) If stories in the media (like posts in other websites) criticize this forum, I would feel bad.

Offline Activities (Ma & Agarwal, 2007) (1 = Never; 7 = Always)

1) I contact other members from this forum by phone.
2) I meet other members from this forum in informal off-line meetings.
3) I actively participate in the regular off-line meetings with other members.
4) I participate in a variety of off-line activities held for this forum.