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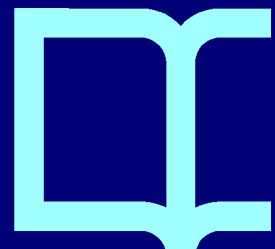
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Understanding the sense of community and continuance intention in virtual communities: the
role of commitment and type of community

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Abstract

Virtual communities (VCs) have become essential in current organizations and society, and so their sustainability is a topic of interest for researchers and practitioners. We focus on the sense of virtual community (SoVC) and commitment as relevant antecedents in achieving the success and maintenance of different types of VCs (communities of interest, virtual learning communities, and virtual communities of practice). Specifically, this study examines a moderated mediation model in which the type of virtual community moderates the indirect effect of a SoVC on the intention to continue through the perceived commitment of the users of the VC. The sample consists of 299 members of Virtual communities. The results showed that SoVC influenced intention to continue via commitment to VCs. Additionally, the relationship between SoVC and commitment was higher for communities of interest and virtual learning communities than for virtual communities of practice. This article contributes to previous literature by identifying the importance of participants' engagement and the

contingent effect of the type of community. Implications of the study and directions for future research are discussed.

Keywords: *Virtual community participation, intention to continue, Virtual learning communities, virtual communities of practice, Communities of interest, sense of virtual community, commitment.*

Introduction

The technological developments achieved recently are changing the way of interacting online, sharing information, creating knowledge, and managing work (Martínez-López, Anaya-Sánchez, Aguilar-Illescas & Molinillo, 2016). These technologies have greatly fostered the development of *virtual communities* (VCs): online social aggregations created through mutual interactions (Li & Lee, 2013; Martínez-López et al., 2016), in which individuals interact around a shared interest in larger numbers than on virtual teams (Blanchard, Wellbourne & Boughton, 2011; Ferran-Urdaneta, 1999; Ridings, Gefen & Arinze, 2002). Communications and relations among participants are at least partially supported and mediated by technology, they are guided by norms or protocols, and they last for a certain period of time (Kozinets, 1999; Porter, 2004).

In a similar way to offline communities, participants in VCs “gather” together, generate social ties, and create online identities with trusted groups (Chiu, Hsu & Wang, 2006) that can develop common projects together and transmit practical experience easily (Luo, Zhang & Zhang, 2019; Majewski, Usoro & Khan, 2011). Consequently, VCs are an effective tool for the development of organizations and society (e.g. Gable, 2015; Slavich & Zimbardo, 2012; Zhang, Johnson, Seltzer & Bichard, 2010). However, the success of VCs rests on a participative scheme: their members’ contributions are necessary for their long-term

viability (Bateman, Gray & Butler, 2011; Bhattacharjee, 2001; Bhattacharjee & Lin, 2015). Therefore, researchers and practitioners have previously tried to understand the variables that facilitate the sustainability of VCs, and they recommend continuing to disentangle these elements (Chen, 2007; Cheung, Lee & Lee, 2013; Fang & Zhang, 2019).

Intention to continue is one of the key variables in understanding the sustainability and success of VCs because it is a driver of behaviour and has become an emerging area in academic research (Bhattacharjee & Lin, 2015; Luo et al., 2019; Nabavi Taghavi-Fard, Hanafizadeh, & Taghva, 2016). In this study, we aim to expand this field of research by analysing how SoVC affects members' intention to continue to participate in VCs. According to past research, SoVC is one of the main elements that fosters participation in VCs (Blanchard & Markus, 2004; Blanchard, 2008; Chen, Yang & Tang, 2013; Luo, Zhang & Qi, 2017). Members of a VC will continue to participate to the extent that they feel part of the community, building an online identity and establishing emotional bonds with the rest of the participants (Abfalter, Zaglia & Mueller, 2012; Luo et al., 2017). However, a lack of social ties and personal information can mean that this identity does not develop in the same way in a virtual context and, thus, is still fragile (Social Identity model of Deindividuation Effects, SIDE) (Reicher, Spears & Postmes, 1995; Spears, Lea & Lee, 1990). In this regard, users are required to make an additional effort in order to reinforce and consolidate SoVC and facilitate the collective behavior and sustainability of the VC. Hence, *commitment* has been shown to mediate the effect of SoVC on various forms of participation in VCs, such as knowledge sharing and student persistence (Chang, Hsieh & Fu, 2016; Laux, Luse & Mennecke, 2016), and so we expect it to mediate the effects of SoVC on intention to continue.

Additionally, the mediating mechanism proposed could vary depending on the type of VC studied. Different types of VC have different objectives, characteristics, and dynamics (Abouzahra & Tan, 2014; Blanchard & Markus, 2004; Dholakia, Bagozzi & Pearo, 2004).

Although there is no consensus about the existing types of VCs or a ubiquitous typology (Porter, 2004), Henri and Pudelko's (2003) VC typology can be useful to distinguish several types of VCs depending on their characteristics. Hence, based on the Henri and Pudelko (2003) typology, we examine whether the type of virtual community moderates the mediating effect of SoVC on the intention to continue through commitment. In this study, we analyse three types of VCs: *communities of interest* are VCs of individuals who gather around a common interest; *virtual learning communities* are VCs of students focused on an academic topic; and *virtual communities of practice* are VCs addressed to professionals who discuss topics related to their jobs or fields of knowledge.

In sum, we study the mediating effect of commitment and the moderating effect of the type of VC on the link between SoVC and intention to continue. This article helps to expand the scarce research available on the mechanisms for fostering participation in different types of VCs, based on SoVC and commitment. We also address the implications of our results for community facilitators and managers, providing useful advice about fomenting participation, considering the nuances of each type of VC. The research model for this study is depicted in Figure 1.

--PLEASE, INSERT FIGURE 1 ABOUT HERE--

Sense of Virtual community and intention to continue: The mediating effect of commitment

Sense of Virtual Community is defined as "*an individual's feelings of membership, identity, belonging and attachment to a group that interacts primarily through electronic communication*" (Blanchard, 2007, p. 827). As in offline communities, users try to establish their own identity as well as the identity of others. Thus, the interaction with other

participants in the community and the interdependence produced creates awareness of the self as part of the community (Ho & Lin, 2016). Moreover, participants become members who create an online identity and seek out information about others' identities in a reification process that fosters the appearance of common identities (Blanchard, Wellbourne & Boughton, 2011; Tonteri, Kosonen, Ellonen & Tarkiainen, 2011). Overall, the intention to continue would greatly increase if participants were able to foster the exchange of support and positive feelings of involvement in the community (Blanchard & Markus, 2004; Ellemers, Kortekaas, & Ouwerkerk, 1999; Rovai, 2002).

However, identity may develop differently in virtual teams from conventional ones.

According to the SIDE model (Reicher, Spears & Postmes, 1995; Spears, Lea & Lee, 1990), the anonymity of the virtual context, due to a lack of personal information (e.g. nicknames, avatars, usernames, and countless user accounts), triggers a deindividuation process that allows the emergence or salience of the collective identity to the detriment of the personal one (Kim & Park, 2011). Nevertheless, this collective identity is still fragile and needs to be cultivated (Zhao, Stylianou & Zheng, 2013). In virtual contexts, it is difficult to achieve a shared emotional connection (Abfalter et al., 2012). Even though a high level of perception of SoVC could provide the users with accessibility and resource exchanges, there is no guarantee that this perception will result in effective and continuous participation in the long term (Gangi & Wasko, 2009). This discrepancy occurs, for example, in large VCs –e.g. World Economic Forum Book Club- with few people posting and several lurkers who feel part of the community even though they are not participating.

In this context, relational aspects such as commitment to the community can become a mechanism that transmits the social identity (Kim, Eisenberger & Baik, 2016; Lee, Park, & Koo, 2015; Gangi & Wasko, 2009; Zao et al, 2013) in order to contribute to the VC and make it sustainable. In fact, as in offline communities, the intention to continue in VCs could also

depend on the members' commitment (Koh & Kim, 2003). Although SoVC is an important variable in the intention to continue, several authors have also mentioned the effect of commitment on the intention to continue, considered through different constructs (Gharib, Philpott & Duan, 2017; Klein, Molloy & Blinsfield, 2012; Van den Hooff & Van Weenen, 2004). Moreover, past research shows that commitment is an important ingredient of the continuance intention of members of VCs (Charband & Navimipour, 2016; Gharib et al., 2017; Laux et al., 2016).

Commitment has largely been studied in management literature (Klein et al., 2012, Meyer, Stanley, Herscovitch & Topolnytsky, 2002; Mowday, Steers & Porter, 1979; Van Rossenberg et al., 2018) and in virtual communities (Chiu et al., 2006; Dholakia et al., 2004; Gupta & Kim, 2007). Although there have been numerous definitions, Klein et al. (2012) have refined the concept, comparing it to related constructs such as identification or intention to participate. Based on their work, we define commitment as a perception of alignment with the goals and values of the community, creating a volitional bond that reflects dedication to the community and responsibility for it (Klein et al., 2012; Van den Hooff & Van Weenen, 2004).

In VCs, SoVC and commitment are related concepts (Chang et al., 2016; Guo & Cheng, 2016; Laux et al., 2016). Personal relations produce social exchanges among participants (Klein et al., 2012), facilitating membership salience and collective identity – SoVC- (Lee et al., 2015), which, in turn contribute to the development of commitment (Klein et al., 2012). In addition, commitment implies a conscious choice to make an effort, work, and help other participants. In this regard, feelings of identity –SoVC- lead to a positive disposition to dedicate time and effort to the virtual community –commitment-, and both affect the intention to continue.

Recent studies propose the mediating effect of commitment between SoVC and participation in different forms. Chang et al. (2016) propose a model that illustrates the mediating effect of commitment in the relationship between SOVC and knowledge-sharing in VCoPs. Specifically, SoVc facilitates interpersonal relationships, which increase the trust and commitment of the users. In addition, their results show that when VC users consider themselves to be part of the community, they feel obligated to contribute to the group and build up a similar approach to that of their teammates. Similarly, Laux et al. (2016) studied dropouts in academic environments and tested a model that examined how SoVC influenced persistence, measured through dropout intention, as well as an indirect effect through affective organizational commitment in Learning VCs. Specifically, the results confirm that the higher the perception of SoVC, the more the users contribute to the VC.

Thus, we propose that, consistent with past literature, members who feel part of a VC (SoVC) after some interaction will feel that they have an obligation to the community as a collective. They will experience greater commitment towards the group, which, in turn, will make them more likely to continue to participate. Moreover, we expect to find a partial mediation of commitment because other important relational capital dimensions related to SoVC (trust, norm, reciprocity) (Chang et al., 2016) could also play a role in transmitting the effects of SoVC on VCs' sustainability. Based on this reasoning and previous research (Abfalter et al., 2012; Blanchard, Askay & Frear, 2010; Chang et al., 2016; Chen et al., 2013; Laux et al., 2016), we hypothesize the following:

H1: Commitment will partially mediate the relationship between SoVC and Intention to continue.

The moderating role of the type of VC

Previous research on SoVC and intention to continue (Blanchard, 2008; Chen et al., 2013) has suggested that there is a mediating effect of commitment (Chang et al., 2016; Laux et al., 2016). However, these studies pay little attention to the differences in this relationship depending on the type of VC, even though different VCs have specific characteristics and internal dynamics that affect the members' SoVC and commitment.

Henri and Pudelko (2003) classified VCs according to two different dimensions that vary on a continuum: the strength of the social bond and the intentionality of the gathering. On the one hand, the strength of the social bond among the members in a VC affects the way interactions take place in the community (e.g. interactions in small subgroups or collective action; reactive vs. proactive participation). On the other hand, the intentionality of the gathering will vary from community to community, depending on the appearance of common objectives and interdependence among the participants (Bock, Ahuja, Suh, & Yap, 2015; Meirinhos & Osório, 2009; Gangi & Wasko, 2009). Both dimensions sequentially increase from less to greater complexity. Thus, whereas some communities have a stronger social bond –e.g. feelings of cohesion and emotional attachment- and intentionality of gathering and interdependence (e.g. communities of practice), other communities are weaker in these dimensions (e.g. communities of interest), with learning communities lying at a midpoint between the other two. Based on the above, we review specific characteristics of the three VC types considered in this study: communities of interest, virtual learning communities, and virtual communities of practice.

Specifically, community of interest participation intention is based on the members' individual contributions to their personal networks (De Valck, Langerak, Verhoef, Verlegh, 2007, Dholakia et al., 2004; Kirkman, Mathieu, Cordery, Rosen & Kukenberge, 2011).

Access is open and free; participants create public or semi-public profiles, articulate a list of connections (e.g. followers with whom you share a topic of interest on Instagram and Quora, connections from groups on social networking sites), and interact with other individuals. They exchange information about the shared topic (De Valck, et al., 2007; Gerard, 2012; Kaplan & Heinlein, 2010). However, participants' interactions are not embedded in a group with a shared mission, and they do not represent a collective effort –low intentionality & a weak social bond (Henri & Pudelko, 2003). Therefore, there is a low level of interdependence, intentionality, and potential anonymity, which makes the ties among participants weaker than in other types, thus hindering the SoVC (Liu, Ainsworth & Baumeister, 2016). In these communities, the interactions are usually one-to-one (people with whom participants may have a previous offline relationship) (Brandtzæg & Heim, 2009, Liu et al., 2016), and few participants have influence over the whole community (e.g. influencers who perceive themselves as dynamic opinion leaders), with several passive users –lurkers- with peripheral participation (Fang & Zhang, 2019; Fischer, 2001). In short, there is a lack of common ground for breeding a strong SoVC because the emotional attachment is to specific individuals, and there is no strong identification or bond with the whole network (Dholakia et al., 2004; Liu et al., 2016).

Virtual learning communities are organised mainly by students (geographically dispersed or not) who belong to the same class or institution. Participation intention is driven by the acquisition of knowledge about the academic topic through common interaction – interdependence-, which benefits the SoVC (Blanchard & Markus 2002). However, it is a task-based community, oriented towards specific learning activities (Gannon-Leary & Fontainha, 2007; Meirinhos & Osorio, 2009). These tasks are based on the formal curriculum, and participants are directly or indirectly required to join temporarily, so that the ties are “artificially” created in some cases, hampering the formation of a strong social bond. In

addition, the intention to continue to participate is limited because the participant has to be a member of the academic institution (Gannon-Leary & Fontainha, 2007; Henri & Pudelko, 2003), which limits the SoVC and makes commitment (the willingness to make an effort) an important variable in participation.

The main goal of the virtual community of practice is the enrichment of the professional practice among its members (Henri & Pudelko, 2003). It is a practice-based community with participants who interact voluntarily -high intentionality-, share expertise, exchange advice and ideas, help others, and develop specific competences while collaborating (Gannon-leary & Fontainha, 2007; Henri & Pudelko, 2003; Wasko & Faraj, 2005). In this community, the participation is intrinsically important to the members (Meirinhos & Osorio, 2009). It builds shared narratives and personal relationships with strong ties (Dholakia et al., 2004), which in turn facilitates the development of a collective identity – strong social bond (Henri & Pudelko, 2003). Moreover, these communities are not time-bounded, and so they develop more organically (Gannon-Leary & Fontainha, 2007).

As described above, SoVC is a major element of participation in VCs (Blanchard, 2008; Chen et al., 2013), but it may depend on the type of VC. Specifically in communities of interest, it is less developed than in the other types of VCs, and participants will only continue to participate if they make an effort to get involved (Henri & Pudelko, 2003). Therefore, we consider that commitment has a greater mediating role in fostering the intention to continue in communities of interest than in the other types of VCs, where the direct effect of SoVC is higher. Specifically, SoVC plays a key role in the intention to continue in virtual communities of practice. The long lifespan and shared experiences among members (Tonteri et al., 2011), as well as the relevance of the interactions and the strong ties, influence the development of a strong SoVC in virtual communities of practice (Chang et al., 2016). Finally, the Learning community lies at the midpoint between communities of interest and virtual communities of

practice in terms of shared emotional bonds and intentionality. Therefore, we consider that the mediating effect of commitment will be lower in virtual learning communities than in communities of interest, but higher than in virtual communities of practice.

In conclusion, consistent with the above-mentioned characteristics and past research, we hypothesize that:

H2: The effect of the SoVC on the intention to continue mediated by commitment varies depending on the type of VC.

H2.1: The indirect effect of SoVC on intention to continue through commitment is higher in communities of interest than in virtual communities of practice.

H2.2: The indirect effect of SoVC on intention to continue through commitment is higher in virtual learning communities than in virtual communities of practice.

H2.3: The indirect effect of SoVC on intention to continue through commitment is higher in communities of interest than in virtual learning communities.

Method

Participants

The sample consisted of 299 individuals from three different VCs, 147 males and 152 females. Regarding their age, 61.5% of the participants were less than 30 years old. Regarding the type of VC, (1) 29.1% of the total sample were practitioners from a virtual community of practice of workers in a confederation of organizations for people with intellectual disability; (2) 18.1% of the total sample were undergraduate students enrolled in the bachelor's degree in Business Administration from the National Distance Education University (UNED) who also participated in a virtual learning community; and (3) 52.8% of the sample were undergraduate

students from the University of Valencia and Polytechnic University of Valencia who participated in different communities of interest.

Procedure

The present research follows a correlational design (Creswell, 2012). The sample was obtained through a convenience sampling method based on their participation in VCs. To do so, we searched for communities that fit the types of VCs in Henri and Pudelko's (2003) typology. Hence, we contacted an organization that used a virtual community of practice and checked the characteristics of the VC. Participants exchanged ideas, opinions, and information about their jobs, gave mutual support and collaborated voluntarily in the community. For the virtual learning community, we wrote community administrators and verified the characteristics of the VC. The community was specifically created and managed by the students to solve doubts, exchange ideas, and comment on the activities held during the course. Finally, we asked for the participation of undergraduate students enrolled in an Organizational Development and Human Resources Management courses in the last year of the university degree at two public Valencian universities, and we recruited individuals who participated in at least one community of interest. They participated in different communities of interest on various topics such as professional networking and content exchange for their fields of knowledge, photography, travelling, or drawing, among others. Participation was voluntary, and they did not receive any material compensation for it. After excluding incomplete answers, 299 responses were used for data analysis.

Measures

- *Sense of virtual community* was measured by 8 items taken from the Peterson, Speer and McMillan (2008) "Brief Sense of Community Scale". This scale has been used in previous research on virtual communities (Mamonov, Koufaris & Benbunan-Fich, 2016; Rosen,

Lafontaine & Hendrickson, 2011). This measure evaluates the extent to which the user feels that he or she is a member, identifies with the community, and has perceptions of belonging and attachment. Original items have been slightly modified for this study (e.g. ‘I can get what I need in this neighbourhood’ was changed to ‘in this VC I can get what I need’). A sample item is “In this VC, I feel like I am member of the community”. The items were measured on a 5-point Likert-type scale ranging from 1 –strongly disagree to 5 –strongly agree-.

Cronbach’s α was .89.

-*Commitment* was measured by 5 items taken from Van den Hooff and Van Weenen (2004). This instrument evaluates the relative extent to which the user perceives him/herself to be involved in the VC, reflecting responsibility for the community and dedication towards it (Klein et al., 2012). A sample item is “I put in extra effort in order to make this community succeed”. We deleted one item for reliability and parsimony considerations (Wieland, Durach, Kembro, & Treiblmaier, 2017) due to low reliability of the scale –below .7 classic cut-off criterion-. A 5-point Likert-type scale ranging from 1 –strongly disagree to 5 –strongly agree- was used to measure the scale. Cronbach’s α was .73.

- *Intention to continue* was measured by six items taken from Zhao et al. (2013). This scale evaluates the user’s estimation of his/her probability of continuing to participate in the VC. A sample item is “I intend to continue to post messages in response to other messages”. Respondents had to indicate their level of agreement on a 5-point Likert-type scale ranging from 1 -very dissatisfied- to 5 -very satisfied-. Cronbach’s α was .89.

Data Analysis

We checked for the correlations and factorial structure of the measures through Confirmatory Factor Analyses by means of Mplus 6.31 (Muthén & Muthén, 1998-2011) and by testing the main fit indexes provided (X^2 , RMSEA, CFI, TLI, and SRMR).

To test the hypotheses, we used the Process 3 plug-in (Hayes, 2017), and the models were estimated for 5000 bootstrapped samples, creating a 95% bias-corrected confidence interval. Mediation and moderated mediation analyses were conducted (Zhao, Lynch & Chen, 2010; Hayes, 2015, 2016; 2017; Hayes & Montoya, 2017).

First, we tested hypothesis 1 through a simple mediation analysis. We entered SoVC as the independent variable, commitment as mediator, and intention to continue as the dependent variable. We tested hypothesis 2 by means of moderated mediation analyses (Hayes & Montoya, 2017; Muller, Judd & Yzerbyt, 2005). The previous variables (SoVC, commitment, and intention to continue) were introduced as specified in hypothesis 1, and type of VC was introduced as a moderator variable. Because type of VC is categorical, the Process 3 Plug-in automatically creates dummy variables (Aiken & West, 1991). We used indicator coding (Hayes & Montoya, 2017). We generated two dummy variables, DRS (comparing virtual communities of practice and communities of interest) and DLC (comparing virtual communities of practice and virtual learning communities). Next, we specified Process model 7. Then, following Hayes and Montoya (2017), we recoded our categorical variable to generate a third dummy variable DEX (comparing communities of interest and virtual learning communities). We checked the results of the moderated mediation index. This test, as explained by Hayes (2015), quantifies the association between an indirect effect and a moderator, testing whether the index is different from zero by means of the Confidence intervals (CI). If the CI does not include zero, we can conclude that there is moderated mediation, and vice versa.

Results

Preliminary analysis

Table 1 summarizes the descriptive statistics and Pearson's correlations.

--PLEASE, INSERT TABLE 1 ABOUT HERE--

Following Byrne's (2012) procedure, we ran two confirmatory factor analyses to evaluate the discriminant validity and verify that the set of items in each construct was measuring a distinguishable factor (although correlated with the others). To do so, we compared the fit of a three-factor model (items load in three different factors: SoVC, commitment, and intention to continue) to the fit of an alternative one-factor model (all the items load in a single factor). Considering that the items were nonnormally distributed (Field, 2009; Gravetter & Wallnau, 2014) and that there was a large difference in the X^2 values, we used MLR estimation. Table 2 presents the fit indexes RMSEA, CFI, TLI, SRMR, X^2/df and the p-values of both models. The three-factor model showed a good fit to the data and met the cut-off criteria for most of the common fit indexes (RMSEA<.08; CFI>.09). Overall, the three-factor model showed a statistically significant better fit than the one-factor model ($\Delta X^2=204.03$, $df=1$, $p<.001$).

--PLEASE, INSERT TABLE 2 ABOUT HERE--

Hypothesis testing

Mediation Model

We found a significant indirect effect of SoVC on Intention to continue through commitment (estimate of ab product term=.1753; Boot SE=.039; 95% CI= .1036 to .2575). Because the confidence Interval (CI) does not include zero, the indirect effect is statistically

significant, and there is mediation (Zhao et al., 2010, Hayes, 2013). This result supports *Hypothesis 1*. Moreover, the direct effect was also positive and significant: the c' shows that SoVC as a predictor of intention to continue had a value of $b = .4669$, $t(293) = 8.0198$, 95% CI = .3523 to .5815. In sum, we have complementary mediation, also known as a consistent model, in which both the direct effect and the indirect effect exist and point in the same direction (partial mediation) (MacKinnon, Fairchild, & Fritz, 2007; Zhao et al., 2010).

Moderated Mediation Model

Supporting *hypothesis 2*, we found that the mediation depended on the type of VC. The results of the moderated mediation indexes (table 3) show that there was a moderated mediation effect on the dummy variables comparing virtual communities of practice and communities of interest (DRS) and virtual communities of practice and virtual learning communities (DLC). The values of the moderated mediation indexes for DRS and DLC were .09 and .12, respectively, with confidence intervals that do not include zero. By contrast, there was no moderating effect of the dummy variable comparing virtual learning communities and communities of interest (DEX). The value of the moderated mediation index for DEX was .03, and the confidence interval included zero.

--PLEASE, INSERT TABLE 3 ABOUT HERE--

Bootstrap analyses showed that the indirect effect of SoVC on intention to continue through commitment was higher for communities of interest and virtual learning communities ($B_{COI} = .20$, 95% CI [.06, .11]; $B_{LVC} = .23$, 95% CI [.11, .36]) than for virtual communities of practice ($B_{VCoP} = .11$, 95% CI [.06, .17]). These results provide support for *hypotheses 2.1* and *2.2*. However, the indirect effect of SoVC on intention to continue mediated by commitment

was similar for virtual learning communities and communities of interest. Thus, our results do not support *Hypothesis 2.3*.

Based on Aiken and West (1991) and Hayes and Montoya (2017), figures 2 and 3 graphically represent the significant interaction effects found in our research. When comparing virtual communities of practice and communities of interest in figure 2, we observe that participants in communities of interest tend to perceive more commitment as SoVC increases, in comparison with virtual communities of practice members. Both simple slopes tests are statistically significant (COIs $t=10.85$, $p<.001$; VCoP, $t=5.40$, $p<.001$). In figure 3, when SoVC increases, so does commitment, but it increases to a greater extent in virtual learning communities than in virtual communities of practice. Members of virtual learning communities with high SoVC show higher commitment than members of virtual communities of practice. The simple slopes test is also significant for the former (virtual learning communities, $t=5.57$, $p<.001$).

--PLEASE, INSERT FIGURE 2 ABOUT HERE--

--PLEASE, INSERT FIGURE 3 ABOUT HERE--

Discussion

The purpose of this research was to enhance the understanding of the reasons members of VCs continue to participate in their communities. To do so, we tested a moderated mediation model in which the indirect effect of sense of VC on intention to continue through perceived commitment was moderated by the type of VC.

Findings

Consistent with previous literature (e.g. Abfalter et al., 2012; Meyer et al., 2002; Laux et al., 2016), the results of this study show that the relationship between SoVC and intention

to continue is mediated by commitment (hypothesis 1). According to the SIDE model, an important theoretical framework in this context (Reicher, Spears & Postmes, 1995; Spears, Lea & Lee, 1990), individuals interacting in VCs create online common identities and try to establish social ties that enhance the exchange of support and participation among the members (Dholakia, Bagozzi & Pearo, 2003, Chiu et al., 2006, Zhang, Jiang & Carroll, 2010). In turn, this participation may promote the establishment and development of VCs because they are based on the altruistic contributions made by their members (Raven, 2003; Kirkman et al., 2011), reinforcing relational aspects and positive attitudes among members of the community. In fact, our findings provide empirical evidence for commitment as a mediating mechanism in the relationship between SoVC and the intention to continue. Overall, not only *what the members feel* about the community, but also their willingness to make a considerable effort on behalf of the community, will lead to its sustainability. Therefore, a successful VC will aim to fulfil its members' need for a common identity and belonging, in addition to making them engage with the community.

This study also concurs with previous research suggesting that different types of VCs operate on different principles (Blanchard et al. 2010, Abouzahra & Tan, 2014; Chang et al., 2016). As explained above, intensified group identification differentially affects sustained participation depending on the characteristics of the VC (Kim & Park, 2011). Therefore, our results show that the relationship between SoVC and commitment is contingent upon the type of VC; in other words, the type of VC moderates the mediation model (hypothesis 2). As our findings show, the indirect effect of SoVC on intention to continue through commitment was higher for communities of interest and virtual learning communities than for virtual communities of practice. Consistent with previous theory and research (Henri & Pudelko, 2003, Meirinhos & Osorio, 2009; Chen et al., 2013, Chang et al., 2016), participation in virtual communities of practice is mediated by commitment, but when compared to other

types (communities of interest and virtual learning communities), it has the smallest indirect effect.

Members of virtual communities of practice participate voluntarily and are intrinsically motivated to do so (Gannon-leary & Fontainha, 2007). In addition, the possibility of long-term participation helps SoVC in these communities to become more relevant to their sustainability than in other types of communities. For people who join a virtual community of practice, creating SoVC could be a means to continue to participate (Ostrom, 2000). On the other hand, in communities with fewer shared emotional connections and social ties and less intentionality –communities of interest and virtual learning communities-, continued participation will emerge more from the members' specific commitment to the community.

Contrary to previous studies (Henri & Pudelko, 2003; Laux et al., 2016; Zhang, 2010;), our results do not show significant differences in the mediation in communities of interest compared to virtual learning communities, with the mediation being equally important in both. The attributes of the members of these two types of VCs may not be as different as expected. In virtual learning communities, participants with a high intention to continue have individual reasons that make them committed to their community (e.g. they personally enjoy the topic or want to get high academic grades). As explained above, participation in virtual learning communities is sometimes a compulsory activity and relevant to a given cohort of students only while enrolled in the institution. Thus, in virtual learning communities, as in a normal -physical- classroom, committed individuals mainly tend to participate. Consequently, we could not find a significant difference between the former and communities of interest, in which individualistic goals and lack of common rules and objectives make commitment a key variable in participation and the strongest mediator. Communities of interest have “the least community” of the different types studied in this research. Thus, community of interest participants are not necessarily active participants (they become lurkers), and they do not

expect others to participate –there is no sense of reciprocity- (Henri & Pudelko, 2003). In addition, the process of negotiating meaning makes a large number of people engage in only peripheral participation, even though they feel part of the community (Fischer, 2001, quoted by Henri & Pudelko, 2003, pp 478), whereas a small group of participants become a committed hard core in the community because of the content they share (Iyengar, Van Den Bulte, Eichert, West & Valente, 2011; Lü, Zhang, Yeung & Zhou; 2011). This situation leads to a weak-tie community in which commitment clearly mediates the direct effect between SoVC and intention to continue.

Limitations & Future research

This study has certain limitations that should be noted, despite the cautious steps taken during the theoretical deduction, data collection, and analyses. First, regarding the design, our research does not allow us to infer causality due to its cross-sectional design. To address this limitation, longitudinal studies are needed to explore the order of the proposed relationships. Second, in future studies that expand our results, one topic to address would be the conceptualization of sustainability as intention to continue. Although continuance intention in Information Systems is a valid predictor of continuance behaviour (Bhattacharjee & Lin, 2015), there are different approaches that future literature could consider when talking about sustainability (Bock et al., 2015). Third, even though examining the context where the VCs were used was not the aim of this study, context could play an important role in the relationships between the studied constructs. Thus, in future studies, the domain of the organizations promoting the VCs should be considered (VCs from public vs private organizations), as well as the type of activity the organization performs (e.g. VCs used in the service industry, in the manufacturing industry, etc.), as other potential moderators. Fourth, commitment was a partial mediator in our model, demonstrating that it is necessary for the sustainability of the VC, but there could be other relational aspects to consider in future

research (trust, norm, reciprocity, or mutual support) that could be mediating the relationship between SoVC and intention to continue. Finally, even though we followed the paradigm suggesting that SoVC increases participation, some authors assume an inverse or circular relationship between these two variables (Tonteri et al., 2011; Talò, Mannarini & Rochira, 2014, Guo & Cheng, 2016), and they use SoVC as a result in itself. Consequently, further research could consider the relationship between these two variables, specifically attending to the antecedents of SoVC in specific types of VCs.

Theoretical & Practical implications

The present study extends the stream of research dedicated to investigating sustainability in VCs (Bock et al., 2015). First, our findings are useful for researchers because we expand previous research about the antecedents of VC continuance intention. VCs' sustainability will depend on the bond perceived by committed participants (instrumental vs. acquiescence) (Klein et al., 2012).

Second, we shed light on the moderating effect of the type of VC in the mediation. The relationship between SoVC and intention to continue is not only mediated by commitment, but it also varies across different types of communities. Although previous literature has empirically considered type of VC as a moderator, along with other constructs (Koh & Kim, 2003; Abouzahra & Tan, 2014), and directly suggested the need to continue to study it (Zhang, 2010, Laux et al., 2016), to date, no study had tested a comprehensive model that included the type of VC as a moderator of the mediation. We have studied three of the most relevant types of VCs today – virtual communities of practice, virtual learning communities, and communities of interest-, overcoming one of the main limitations of previous research in the field of VCs, that is, only addressing one specific community (e.g. Laux et al., 2016; Chang et al., 2016; Frison & Eggermont, 2016). Our findings suggest an important implication: *how and when SoVC is effective for achieving sustainability in VCs.*

We found that commitment and type of community are key factors that contribute to explaining different mechanisms through which SoVC affects sustainability in VCs. Specifically, in virtual communities of practice, SoVC is a key variable, and commitment is less relevant than in other types of VCs –such as, in our case, communities of interest and virtual learning communities.

Thus, to be sustainable, organizations must create VC environments that will favour users' retention. Our results have practical implications for community managers, companies, and organizations whose business model is based on a VC. To create or develop a VC that withstands the test of time, it is necessary to retain the members and foster their participation (e.g. posting questions, asking and answering doubts, exchanging relevant information). To do so, community managers and organizers need to work on individuals' emotional perceptions and facilitate participants' positive feelings towards the community through their interactions -replying to comments, attending to personal information disclosures that allow them to build online identities, answering questions thoughtfully, considering the feedback received by participants, creating spaces for virtual gathering, etc -. Moreover, even if participants have feelings of immersion, emotional attachment, membership, and belonging – high SoVC-, community managers should work on engaging key members, that is, participants who post popular content and contribute significantly to the VC. These members are committed individuals who participate, and they could become VC facilitators and motivate other members to get involved.

Furthermore, it is important to address the goals and motives of the specific community one wants to build, its characteristics, and its target participants because, as our study shows, each VC works in a particular way that influences its sustainability. For example, in light of our results, virtual learning communities could become virtual facilities that substitute physical spaces (Hiltz & Wellman, 1997). By contrast, virtual communities of

practice will require more careful work by the organizer in preparing activities (e.g. allow public profiles, manage individual cues that foster individual or collective identities, allow reward systems and participation rankings) that facilitate the emergence of a strong feeling of belong, attachment, and SoVC.

Conclusion

Currently, the use of VCs is increasing, and this tendency will continue in the future in several contexts, such as politics (Zhang, Johnson et al., 2010; Gable, 2015), education (Slavich & Zimbardo, 2012; Latif, Uçkun, & Demir, 2015), or work and commercial practice (Li & Lee, 2013; Aghakhani, Karimi, & Salehan, 2018), among others. The globalization of advanced societies is leading to a highly virtualized, hyper-connected world. Our study provides an interesting framework for understanding the effect of SoVC and commitment on sustainability in different types of virtual communities, providing a valuable perspective for in-depth understanding of members' behaviours in such communities. We carried out a comprehensive approach based on previous theory and research, and we proposed an effective model for sustainability in VCs. Our findings indicate that sustaining and developing a VC requires fostering a sense of community and commitment that engages participants, but the relative importance of the elements will vary depending on the type of VC.

Declaration of Conflicting Interests

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Data Availability

To access an anonymized version of the data presented in this article, please contact the corresponding author at virginia.orengo@uv.es

Software Information

The computer software used to obtain the reported results were SPSS 22.0 (SPSS, IBM, New York, NY, USA), Process 3 plug-in (Hayes, 2017) and Mplus 6.31 (Muthén & Muthén, 1998-2011).

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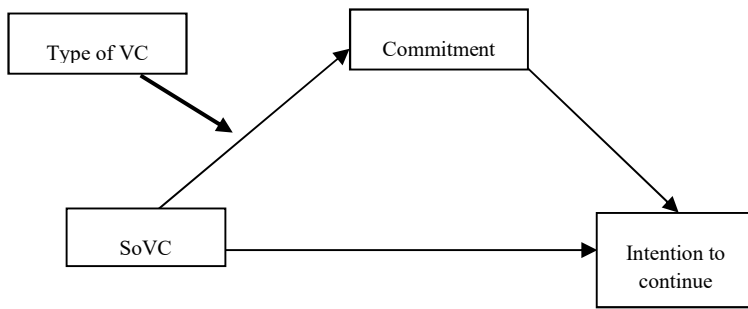


Figure 1. Theoretical model

Table 1. Means, standard deviations, and correlations

	Mean	SD	1	2	3
1. SOVC	4	0.87	(.89)		
2. Commitment	3.42	0.88	.656**	(.73)	
3. Int. To continue	4.32	0.87	.635**	.568**	(.89)

** $p < .01$ (two-tailed). Inter-item reliability values are in parentheses along the diagonal.

Table 2. Confirmatory Factor Analyses

Model	χ^2/df	<i>P</i>	RMSEA	CFI	TLI	SRMR
Three factors	2.06	<.001	.061	.94	.93	.058
One factor	3.85	<.001	.100	.83	.81	.068

Table 3. Moderated mediation indexes.

Moderator	<i>Index</i>	<i>BootLLCI</i>	<i>BootULCI</i>
DRS	.09	.04	.17
DLC	.12	.02	.23
DEX	.03	-.06	.11

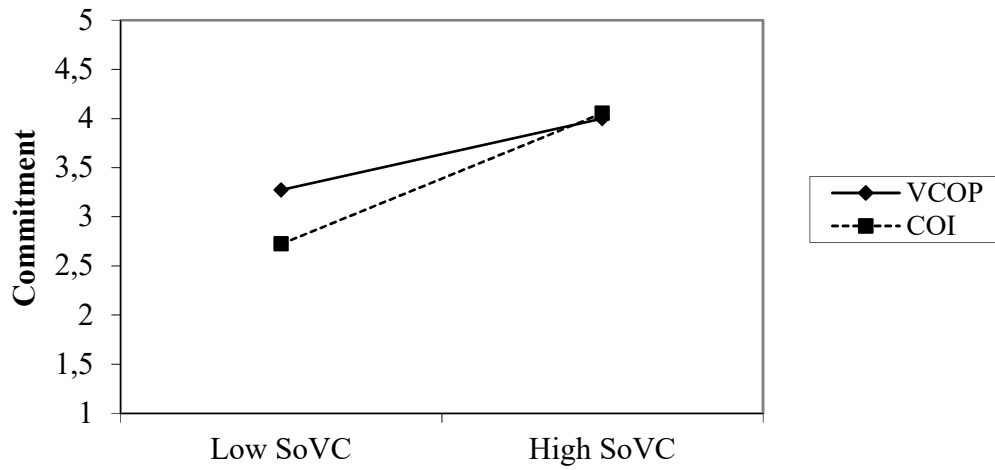


Figure 2. Simple Slopes: Type of VC (virtual community of practice and community of interest) moderating the relationship between SoVC and Commitment.

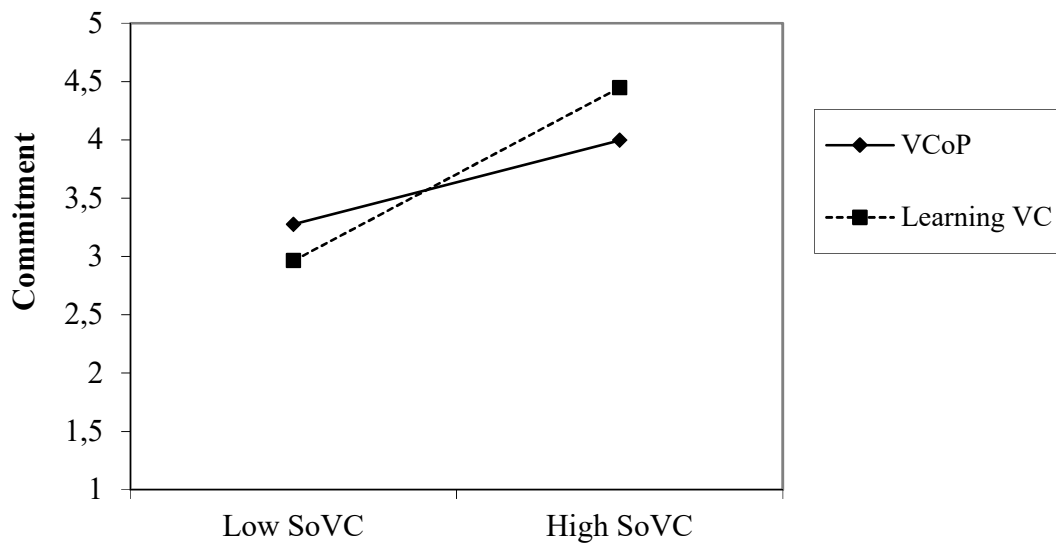


Figure 3. Simple Slopes: Type of VC (virtual community of practice and virtual learning community) moderating the relationship between SoVC and Commitment.