



Key factors in Knowledge Sharing Behavior in Virtual Communities of Practice: A Systematic Review

Factores clave en el comportamiento de compartir conocimiento en las comunidades de práctica virtuales: una revisión sistemática

Roberto Hernández-Soto^{a*}, Mónica Gutiérrez-Ortega^b, Bartolomé Rubia-Avi^c

^a Departamento de Teoría e Historia de la Educación, Facultad de Educación, Universidad Internacional de la Rioja, Logroño, España
<https://orcid.org/0000-0002-3505-3108> roberto.hernandez@unir.net

^b Departamento de Teoría e Historia de la Educación, Facultad de Educación, Universidad Internacional de la Rioja, Logroño, España
<https://orcid.org/0000-0002-1536-4240> monica.gutierrez@unir.net

^c Departamento de Pedagogía, Facultad de Educación y Trabajo Social, Universidad de Valladolid, Valladolid, España
<https://orcid.org/0000-0002-4963-4552> brubia@pdg.uva.es

*Corresponding author

ARTICLE INFO

Keywords:

Communities of Practice
 VCOP
 knowledge sharing
 knowledge management
 organizational behavior
 systematic review

Palabras clave:

Comunidades de práctica
 Comunidades Virtuales de práctica
 intercambio de conocimiento
 Gestión del conocimiento
 Comportamiento organizacional
 Revisión sistemática

ABSTRACT

Virtual Communities of Practice (VCOP) are environments widely recognized as knowledge management instruments, and their sociocultural contributions are being incipiently valued. However, VCOPs are complex participation contexts due to their sociotechnical and sociocultural nature. Participation mechanisms, particularly Knowledge Sharing Behavior (KSB), have been studied from heterogeneous theoretical foundations and practical research methods. Therefore, a wide dispersion of factors and dimensions has been identified. This paper aims to present an overview that summarizes and systematizes the key drivers of KSB in VCOPs. This paper presents a systematic review of KSB in VCOPs, based on 42 studies retrieved from WOS, SCOPUS and Science Direct. The review was conducted using the PRISMA model. The selection and qualitative synthesis of articles was enriched using Nvivo for coding and analysis of the full text documents. The results suggest that KSB in VCOPs have a multidimensional and multifactorial character that includes personal, interpersonal, contextual, and technological factors. The typology of factors presented could serve in academic settings to conduct new theoretical or empirical research, or in practitioner settings to implement VCOPs in institutions across diverse sectors. New assessment instruments of KSB in VCOPs could be based on this typology.

RESUMEN

Las Comunidades de Práctica Virtuales (VCOP) son entornos ampliamente reconocidos como instrumentos para la gestión de conocimiento y, de manera incipiente, se están empezando a valorar sus contribuciones desde el punto de vista sociocultural. Sin embargo, las VCOP son contextos de participación complejos por su naturaleza sociotécnica y sociocultural. Los mecanismos de participación, particularmente el comportamiento de compartir conocimiento (KSB), se han abordado desde fundamentos teóricos y métodos de investigación extremadamente heterogéneos. Como resultado, se ha identificado una gran dispersión de factores y dimensiones. Este artículo trata de presentar una visión general que resuma y sistematice los factores clave del KSB en las VCOP. Este artículo presenta una revisión sistemática sobre el KSB en las VCOP, basada en 42 estudios recuperados de WOS, SCOPUS y Science Direct. La revisión se ha realizado utilizando el modelo PRISMA. La selección y síntesis cualitativa de los artículos se ha enriquecido utilizando Nvivo para codificar y analizar los artículos a texto completo. Los resultados sugieren que el KSB en las VCOP tiene un carácter multidimensional y multifactorial que incluye factores personales, interpersonales, contextuales y tecnológicos. La tipología de factores que se presenta podría ser utilizada en contextos académicos para desarrollar nuevas investigaciones teóricas o empíricas, o como en contextos profesionales para implementar VCOPs en instituciones de diversos sectores. Nuevos instrumentos de evaluación sobre el KSB en las VCOP podrían basarse en esta tipología.

1. Introduction

In the sociotechnical and sociocultural context of the network society (Castells, 1996), the importance of knowledge for the success of citizens, workers, and organizations is widely recognized (Nonaka, 2007; Davenport & Prusak, 2000).

In the field of organizational development, especially in the area of knowledge management (KM; Bolisani & Scarso, 2014), there is growing interest in understanding the mechanisms and channels involved in the creation, storage, recovery, and use of knowledge (Retna & Tee, 2011). Accordingly, Communities of Practice (COPs; Wenger, 1999) have become a powerful setting for the creation and sharing of knowledge (Alali & Salim, 2013; Wenger, McDermott & Snyder, 2002; Hernández-Soto, Rodríguez-Medina & Gutiérrez-Ortega, 2020) and a mechanism widely used in KM (Bolisani & Handzic, 2015).

COPs are «groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis» (Wenger et al., 2002:4). Although in the original conception, COPs were considered informal and self-directed groups (e.g., Brown & Duguid, 1991; Wenger, 1999; Lampel & Bhalla, 2007), their interest in organizations has increased, such that they have become an institutional asset that must be managed (McDermott & Archibald, 2010; Bourhis & Dubé, 2010) or, at least, cultivated or promoted by the organization (Jeon, Kim & Koh, 2011a, 2011b). Currently, COPs constitute a key element of KM, aligning individual knowledge with institutional goals (Retna & Tee, 2011).

Technological advances are leading to the expansion of the scope and capabilities of *offline* COPs, creating independent and effective online communication and collaboration settings of traditional spatial-temporal variables (Hildreth, Kimble & Wright, 2000). Virtual Communities of Practice (VCOPs) have been described by Lee-Kelley and Turner (2017:66) as communities «designed and implemented as an organizational intervention, using multiple electronic synchronous and asynchronous platforms to facilitate the commitment of local, project and organizational peers, and of mutual learning».

In recent years, VCOPs are increasingly relevant (Bicchi, 2011) not just because they transcend the need of physical proximity, but also due to their contribution to KM, capturing and sharing the expert knowledge of the members, distributing their know-how, ideas, problems, innovations, talents, and experiences (Wenger et al., 2002). Beyond the KM system, VCOPs have a deep transformational power due to their contributions from a sociocultural viewpoint (Hou, 2015; Ardichvili et al., 2006). Accordingly, new emerging issues, such as individual and community empowerment (Kirkman et al., 2011), the construction of professional identity (Nistor & Fischer, 2012; Nistor et al., 2014), or the potential impact of participation in the culture of the organization and in the social setting (Ardichvili, 2008; Bourhis & Dubé, 2010), require new approaches to the study of VCOPs.

Both in COPs and in VCOPs, Knowledge Sharing Behavior (KSB; Tseng & Kuo, 2014) is one of the most relevant and studied constructs due to its influence on the viability and success of this type of communities (Jeon et al., 2011a). In fact, Fang and Chiu (2010) point out that the greatest challenge for the functioning of a VCOP is the existence of a continuous contribution of knowledge; therefore, it is of vital importance to know the mechanisms involved in this process. The study of the factors that drive KSB will allow us to delve into the scope of the transformations arising from the sphere of KM (e.g., individual learning and development or organizational improvement), and in the sociocultural sphere (e.g., creation of a culture of participation and collaboration in digital media). However, there is a huge dispersion in the theoretical and methodological approaches to research that have been used and, therefore, in the factors and dimensions identified by previous studies.

In order to provide an integrative view, this article presents a systematic review of the factors associated with KSB in VCOPs. The purpose of this paper is to explore the factors associated with knowledge sharing in VCOPs across different sectors, cultures and countries. This systematic review will provide a broad vision by analyzing the common factors associated with KSB in VCOPs and it will be useful to the academics and practitioners to understand the factors involved in different cultural and organizational contexts.

2. Methods

The goal of the study was to perform a systematic review of the factors involved in KSB in VCOPs. The review was conducted using the PRISMA model (Moher et al., 2009). The results can serve as a basis for future academic research or for implementations of VCOPs in institutional contexts.

2.1. Inclusion criteria

Studies were included in the review if they met the following criteria: (a) focused on VCOPs (b) analyzed factors involved in KSB (c) presented theoretical or empirical studies that used qualitative, quantitative, or mixed methodologies, (d) published in English in peer-reviewed journals.

Results on other similar groups were excluded (Network of Practice, Research Consortia, Personal Network, Community of Scholars, Occupational Community, Virtual Community, Professional Virtual Community).

2.2. Search strategy

First, an initial search was performed in the Web of Science (WOS), SCOPUS y Science Direct (SD) databases, using the terms "virtual communities of practice" and "knowledge sharing", in English and without time limit. The searches focused on the title, abstract, and keywords.

Second, to identify studies focused on VCOPs and KSB but that did not use these terms explicitly, a second search was performed in the aforementioned databases. A generic search of COPs (using the term "communities of practice") was implemented, and a subsequent manual refining of the results was conducted in accordance with the inclusion criteria. To narrow the number of results and ensure their relevance, the search was restricted to studies after 2010 that were cited 10 or more times in the above-mentioned databases. The search focused on the Social Sciences, Education Educational Research and Business, and Management and Accounting sectors.

2.3. Selection of studies

In the search for *virtual communities of practice* and *Knowledge Sharing*, a total of 176 registers were recovered. In the search of *communities of practice*, 1,061 registers were obtained, of which 196 met the criterion of 10 or more citations.

Subsequently, duplicate registers were deleted, and two independent researchers selected the articles that met inclusion criterion "d" by title and abstract. A total of 221 articles were included in the qualitative phase, and were full test analyzed using Nvivo 11.4.3. Finally, 42 articles were identified for qualitative synthesis for meeting the systematic review criteria.

In Figure 1, the flow followed in the searches and the selection process is depicted.

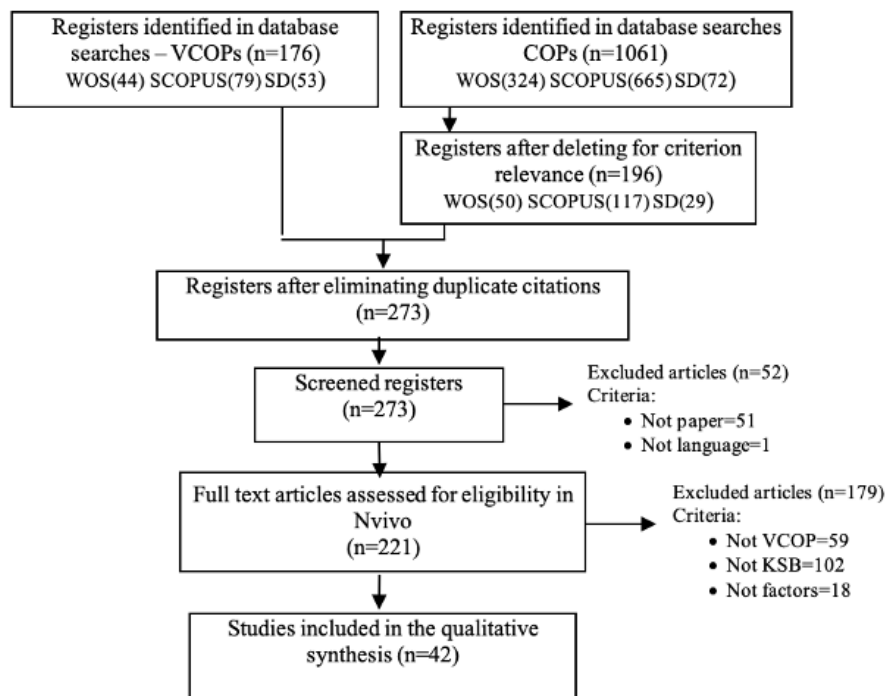


Figure 1. PRISMA flow diagram of search and analysis strategy (Moher et al., 2009).

3. Results

This section presents the results of the systematic review conducted on KSB in VCOPs. The systematic review included 42 studies that met the inclusion criteria. Among the total studies, 11 (26,19%) were published from 2004 to 2010, while the remaining 31 studies (73.81%) were published between 2011 and 2018. Table 1 shows the structure of categories, dimensions and sub-dimensions, and factors that comprise the resulting typology.

Categories	Dimensions/Sub-dimensions	Factors
Personal (P)	Helping behaviors	Altruism; pro-community behavior
	Need for affiliation	
	Expertise	
	Self-directed learning	Autonomy; individual motivation; member empowerment
	Beliefs and outcome expectations	
	Behavioral beliefs	Competence/work efficiency; anticipated reciprocal relationship; effort expectancy; reputation; anticipated recognition and rewards; reciprocity; information Quality
	Normative beliefs	Social influence
	Control beliefs	Self-efficacy; managing internal/external constraints
	Outcome expectations	Reciprocity; helping others; information quality; knowledge usefulness; perceived ease of use
Interpersonal (I)	Trust and justice	Trust; justice
	Leadership	
	Social ties	
	Expert status	
	VCOP empowerment	
	Relational structure of the VCOP	Connectivity; interactivity; a broad church
Contextual (C)	Community (as context)	Domain; open community; autonomy
	Parent organization	Organizational culture; organizational support
	Cultural context	Degree of collectivism; saving face; modesty; competitiveness; modes of communication and sharing; openness to knowledge sharing; concern for others; self-reflection; perceived knowledge credibility
Technological (T)	Individual factors	Technology use anxiety; technology-related expertise; technology use intention
	Technical factors	Technology quality
	Environmental factors	Technical support

Table 1. Typology of factors associated with KSB in VCOPs.

The results show that VCOP members execute or inhibit KSB as a function of aspects related to: (1) their own characteristics and beliefs or personal expectations (personal factors), (2) the relations established between the members (interpersonal factors), (3) the community environment of reference (contextual factors), and (4) the technological environment in which communication is performed (technological factors) (see figure 2).

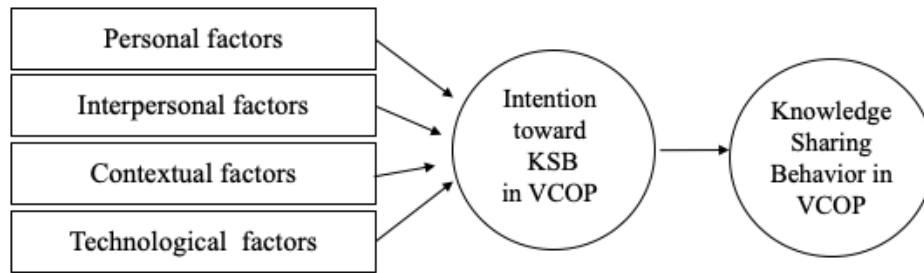


Figure 2. Categories of the typology

3.1. Personal factors

A total of 26 studies provided information on personal factors (see figure 3).

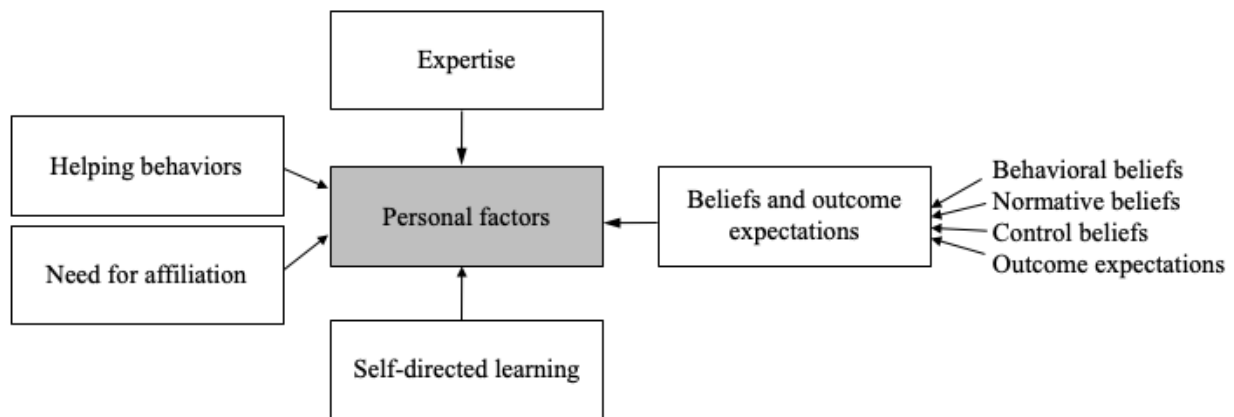


Figure 3. Personal factors.

Helping behaviors directed at other VCOP members (altruism) or targeting the community (pro-community behaviors) are identified in prior literature as key determinants of KSB (Jeon et al., 2011a; Fang & Chiu, 2010; Shaari, Bakri & Rahman, 2015; Wei et al., 2018). Fang and Chiu (2010) suggest that altruism depends on trust in the members, whereas pro-community behavior depends on trust in the direction of the community. According to Jeon et al. (2011a), the influence of internal motivations (such as altruism or the need for affiliation) is greater than that of external motivations (such as image and reciprocity), especially in informal communities. In formal communities, external factors—anticipated organizational rewards, reciprocity, and reputation—tend to prevail over internal factors (Assegaff, Kurniabudi & Fernando, 2016).

According to (Jeon et al., 2011a), the *need for affiliation*—the desire for *social contact with other members and membership in the VCOP*—is especially relevant in informal communities. This outcome is consistent with Lee-Kelley and Turner (2017), who indicate that the need for affiliation encourages altruistic KSB. In turn, professionals are more visible in the organization—and improve their reputation—and extend their network of personal contacts in the organization.

Another key factor in KSB is member experience on the community domain (Nistor & Fischer, 2012). *Expertise* has more influence on participation when it is understood as the quality of the interventions and not simply as permanence in the community (Nistor et al., 2014). This finding is coherent with Cheung, Lee, and Lee (2013), who underline the special importance of expert knowledge in VCOPs to respond to the complexity of the matters that these groups of professionals address.

The factors associated with *self-directed learning* are highlighted in the previous studies, with autonomy (Lee-Kelley & Turner, 2017), individual motivation (Retna & Tee, 2011) and member empowerment (Hou, 2015), emerging as key elements to promote participation in VCOPs. These three components appeal to the individual capacity to commit to and manage one's own learning and development process, as an essential determinant for the functioning of communities.

Besides the indicated factors, the results underline the importance of *beliefs* in the KSB of the members of a VCOP. In accordance with the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 2015), beliefs are subjective probabilities that have a decisive influence on the intention and subsequent performance of a behavior.

Behavioral Beliefs (expectations or consequences of KSB) are materialized in aspects such as: (1) the improvement of professional competence and daily work efficiency (Tseng & Kuo, 2014), (2) the establishment of reciprocal relationships (Jeon et al., 2011b), (3) the effort expectancy (Nistor et al., 2014), (4) the impact on personal image and reputation (Assegaff, Kurniabudi & Fernando, 2016; Wei et al., 2018), (5) the anticipation of recognition, rewards, and incentives (Fahey, Vasconcelos & Ellis, 2007; Jeon et al., 2011a,b), (6) the anticipation of reciprocity (Chiu, Hsu & Wang, 2006; Jeon et al., 2011a; Wei et al., 2018), and (7) the quality of the information shared in the community (Alali & Salim, 2013; Ho & Kuo, 2013).

Normative beliefs (perceived social pressure towards KSB) are associated with the *social influence* factor studied by Nistor, Baltes, and Schustek (2012), Nistor, Schworm, and Werner, (2012), and Nistor et al. (2014). Jeon et al. (2011b) found that the probability of sharing knowledge increases if the individual believes that this behavior is approved by his social group of reference or if he/she believes that those referents would also perform it.

Control beliefs about the behavior refer to the personal or contextual factors that inhibit or facilitate KSB. According to Cheung et al. (2013) and Tseng and Kuo (2014), the perception of self-efficacy of one's knowledge has a significant effect on the intention to continue sharing knowledge in the community. Jeon et al. (2011a) expand the concept of self-efficacy, considering the perception of the capacity to manage both personal constraints and external constraints.

Finally, the importance of the confirmation/disconfirmation of the outcome expectations is revealed. Studies have shown that the intention to continue sharing knowledge in VCOPs depends on whether the members fulfill their expectations associated with: (1) reciprocity (Fang & Chiu, 2010), (2) their capacity to help others (Cheung et al., 2013), (3) the practical usefulness of the knowledge, and (4) the quality of the information shared (Alali & Salim, 2013; Ho & Kuo, 2013).

3.2. Interpersonal factors

Twenty-two studies provided information on interpersonal factors (see Figure 4).

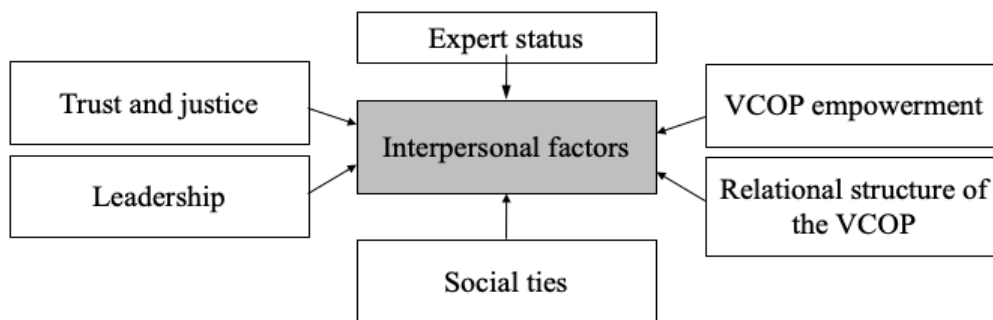


Figure 4. Interpersonal factors.

The findings of this systematic review reveal that *trust* in a VCOP can be established at different levels: member-member (Chiu, Hsu & Wang, 2006; Usoro et al., 2007), member-manager (Fang & Chiu, 2010), member-institution (Ardichvili, 2008), or member-channel used for the knowledge exchange (Mason, Castleman & Parker, 2008). The perception of the *competence*, *integrity*, and *benevolence* of other participants is essential in member-member trust and has decisive influence on the intention of sharing knowledge (Fang & Chiu, 2010; Usoro et al., 2007).

Likewise, Fang and Chiu (2010) underline the importance of these three traits at the member-managers level, such that participant trust in the competence, integrity, and benevolence of the manager—along with the quality the previous interactions with the participants—are crucial to win the trust of the members.

The findings of Fang and Chiu (2010) identified *justice* as a precursor of trust. On the one hand, trust in members depends on reciprocity (distributive justice) and on the quality of the relations (interpersonal justice) and acts as an antecedent of altruistic behavior. On the other hand, trust in managers is based on the justice of

the policies and procedures of the community (procedural justice) and on promptly informing the members of the procedures of the group (informational justice). The results guarantee trust in managers as a key determinant of pro-community behavior. Majewski, Usoro, and Khan (2011) and Usoro and Majewski (2011) found a positive relation between trust and the perception of the community that, in turn, facilitates dual role of the participants as providers and recipients of knowledge in a VCOP.

Another relevant factor for KSB is the *leadership* that is established in the community (Hurtubise et al., 2016; Seba, Rowley & Lambert, 2012). Barnett et al. (2014) highlight the figure of the facilitator to promote the commitment of the participants, ensuring the standards of the community and promoting participation. Paasivara and Lassenius (2014) indicate that leaders—preferably experts in the domain of the community—provide an institutional vision, organize the agenda, maintain the rhythm of the group, and encourage participation. Lastly, the findings of Retna and Tee (2011) reveal not only the importance of the leader as a support and help figure for the members, but also the benefits of distributed leadership, assumed by different people as a function of the area of knowledge involved.

The *personal ties* among the participants facilitate the awareness that the community exists and are therefore decisive for shaping the perception of the community (Usoro & Majewski, 2011). According to Tseng and Kuo (2014), the strength of the relationships among the participants is at the same time an antecedent and an outcome of their participation. On the one hand, personal ties favor altruistic behavior and the perception of self-efficacy of one's knowledge to help others. On the other hand, they found that participation in the community improves closeness, intimacy, and support among the members. Mason et al. (2008) found that social ties were stronger and more visible in face-to-face contacts than in other online channels in which professional communication prevailed over personal or social communication. This outcome is consistent with the work of Bourhis and Dubé (2010), revealing the importance of technology to maintain the online community and of presential meetings to build relationships to improve online interaction. The construction of the community is also related to the use of a shared and simple language (Antonacci et al., 2017) and with the courtesy, dignity, agreeableness, and respect that the members received (Interpersonal Justice) (Fang & Chiu, 2010). Interpersonal justice increases trust in other members, which favors altruistic behavior and the intention to continue contributing to the VCOP.

Together with the above aspects, the *expert status* is highlighted. According to Wenger (1999), the identity of the members in the community has an individual component (expert knowledge or expertise) and a social component (fruit of their social interactions in the group). In contrast to expert knowledge, which is a personal characteristic, expert status is awarded by the community as acknowledgment of the contribution of their members (Nistor & Fischer, 2012). In fact, participation plays a prominent role in the acquisition of expert status and, therefore, in the identity of the members within the community (Nistor et al., 2014). Consequently, expert status has a relational component that denotes the degree of centrality of each member in the community (Xu et al., 2015; Nistor et al., 2014; Antonacci et al., 2017). Nistor and Fischer (2012) conclude that expert status acts as the key determinant in the development of cultural artifacts (for example, concepts, shared vocabulary, or theoretical corpus).

Another salient factor in systematic review is the *VCOP empowerment* as a precursor of the online collaboration and performance of the group (Kirkman et al., 2004). According to Kirkman et al. (2011:1236), the empowerment of the community denotes the “increased task motivation due to members’ collective, positive assessments of their tasks within an organizational context.” Consequently, knowledge sharing (KS; Usoro et al., 2007) could be influenced by collective belief of the members about their capacity to generate value in their organization. Kirkman et al. (2011) underline the importance of the behaviors of the organizational leaders favoring the community for the development of collective empowerment.

To complete the interpersonal factors, the results reveal the importance granted by the previous studies to the *relational structure of the VCOP*, considering its connectivity (network structure) and interactivity (evolution of interactions over time) (Antonacci et al., 2017), and the existence a diverse community (a broad church with heterogeneous profiles) (Barnett et al., 2014; 2016). The results of Antonacci et al. (2017) on formal communities reveal that communities with centralized leadership grow faster. Centrality indicates the presence of experts, which emphasizes the importance of their role as leaders in the growth of the community. However, the results in emerging communities (Xu et al., 2015) reveal a structure of decentralized communication without groups that monopolize the conversation. With regard to interactivity, on the one hand, participants value the rotational nature of the leadership, which stimulates the incorporation of new active members and KS, and, on the other hand, a high rate of past activity, reinforcing the visibility of the community. Barnett et al. (2016) suggest that the participation of different profiles is a factor of success because the various degrees of knowledge enhance the richness and effectiveness of the exchanges. According to Xu et al.

(2015), this inclusive participation may contribute to the diversity of the information sources involved in the VCOP. The diversity of the community should be controlled to prevent members from feeling saturated (Barnett et al., 2014).

3.3. Contextual factors

Contextual factors were analyzed in 21 studies across 3 dimensions (see Figure 5).

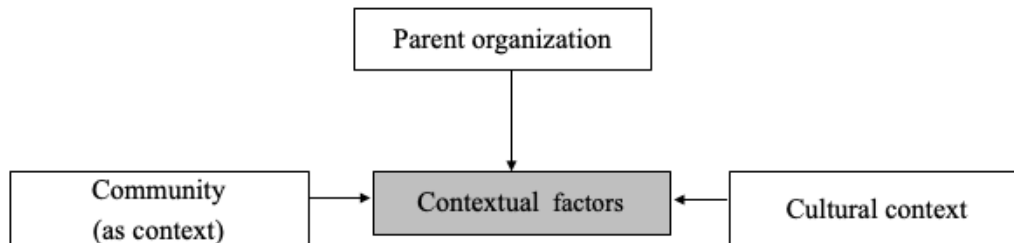


Figure 5. Contextual factors.

The results highlight the importance of the contextual factors as antecedents of KSB in VCOPs. Contextual factors are related to the characteristics of the community (domain, openness, and autonomy), the parent organization (culture and support), and the cultural environment.

The close connection between the domain of the community and the daily work is a key factor that motivates participation and the success of the VCOP (Paasivaara & Lassenius, 2014). This finding is consistent with Nistor and Fischer (2012) and Nistor et al. (2014) who identify the domain of knowledge as one of the determinants of participation. Paasivaara and Lassenius (2014) emphasize the importance of preventing the community from becoming a closed or elitist group with centralized participation and decision-making (see informational and procedural justice in Fang and Chiu, 2010). On the contrary, community openness is closely related to the above-mentioned inclusive and diverse participation and means that people with different expert status can participate in the community's life. In addition, the members are more willing to participate when the VCOP has its own agenda (with matters of interest for their daily work), authority to make decisions (respected by the organization), and an adequate rhythm of activity (number of items on the agenda) (Paasivaara & Lassenius, 2014). According to this study, the role of the leader is essential to ensure that the contents and number of items on the agenda facilitate continued participation.

Ardichvili (2008) and Bourhis and Dubé (2010) consider that the *culture of the parent organization* is one of the most important facilitators of participation in VCOPs and suggest that values and cultural norms guide the decision of the members to share their knowledge in the community. According to Paasivaara and Lassenius (2014), organizational culture influences the autonomy of the VCOPs to establish their own agenda and make decisions. As part of the institutional culture, Bourhis and Dubé (2010) indicate the importance a culture oriented toward KS as a factor of the success of VCOPs. This culture can materialize by recognizing participation in the systems of performance assessment, assigning part of the workday to participation or through the example of the leaders. According to Gammelgaard (2010), the KS culture promotes swift trust among the participants. In contrast, Thang et al. (2011) noted that the organizational culture can generate mistrust and inhibit participation due to lack of confidentiality and privacy, or when negative consequences are expected for revealing personal opinions. The findings of Retna and Tee (2011) show that communication, positive interaction, and collaboration, as components of the organizational culture, facilitate knowledge sharing. In addition, a shared organizational vision contributes to maintaining the interest in the community and encourages continued participation.

In addition to the culture, KSB is mediated by organizational support systems (Barnett et al., 2012; Nistor et al., 2012a; 2012b) that involve a set of facilitating conditions whose presence or absence determine behavior (Triandis, 1980; Jeon et al., 2011a). Support includes the existence of time to share (Thang et al., 2011; Li, 2010; Seba et al., 2012), physical spaces for the activities (Jeon et al., 2011a), an environment of support (open participation that is valued by the organization and by the leaders) (Barnett et al., 2012), and the availability of technical infrastructure (communication systems) (Paasivaara and Lassenius, 2014). The bureaucratic and normative institutional environment can also act as a barrier or facilitator of KSB (Harvey et al., 2013; Gammelgaard, 2010; Seba et al., 2012). According to Jeon et al. (2011a, 2011b), facilitating conditions include aspects like training

in KS and the promotion of VCOP activities, the figure of the consultant to help with KS, the use of information systems and technological support (see also Nistor et al., 2014).

Another factor that is arousing growing interest is the *cultural context* due to the influence of the national culture and, where appropriate, transnational culture in the participation in VCOPs (Hou, 2015; Gallagher and Savage, 2013; Li et al., 2007; Li, 2010). Hou (2015) found that values of the Chinese culture (inherited from Confucianism) —such as the seeking the collective interest and common goals, concern for others, and the importance of self-reflection— promoted collaborative learning and encouraged collective reflection about the practice. At the same time, participation in the community was generating profound transformations in social behavior (more democratic and egalitarian) and in the learning process (more self-directed and peer-supported). As cultural elements that affect KSB, Ardichvili et al. (2006) identified the following: the degree of collectivism (see also Li, 2010), the fear of losing face, modesty, competitiveness, the way of communicating and sharing, and willingness to share knowledge. Li (2010) adds *Perceived knowledge credibility* based on the differences in the avoidance of uncertainty among the different cultural groups. On one side, members of cultures with high avoidance of uncertainty have difficulties granting credibility to knowledge that is shared in the community if it does not come from recognized authorities. On the contrary, cultures with low uncertainty avoidance, encourage people to share their knowledge (see also Ardichvili et al., 2006).

3.4. Technological factors

Technological factors have been analyzed in 11 of the 42 studies included in the review (see Figure 6).

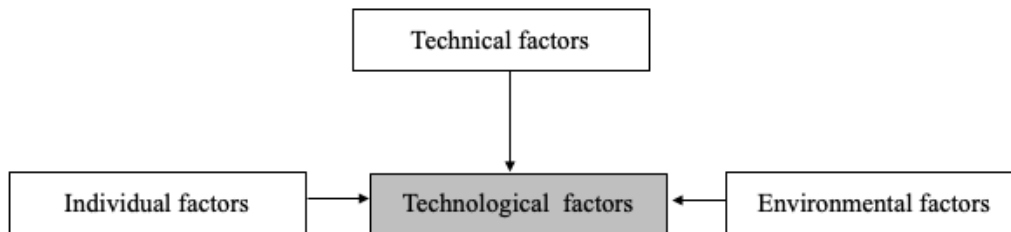


Figure 6. Technological factors.

Due to the substantial intermediation of technology in VCOPs, the associated factors acquire special relevance in its functioning and effectiveness. In the technology-KSB relation, prior studies identify: (1) individual factors (technology-use anxiety, technology-related expertise and technology-use intention), (2) technical factors (quality of the technology system) and (3) environmental factors (technical support). According to Nistor et al. (2012b), technology-related expertise in systems used in the community facilitates KSB. However, Nistor et al. (2014) identified a low influence of technology-use anxiety and technology-use intention on participation. With regard to technical factors, the results emphasize the importance of the quality of the technology system (Ho & Kuo, 2013; Alali & Salim, 2013; Seba et al., 2012) and its usability and user orientation (Barnett et al., 2014; Thang et al., 2011; Mason et al., 2008; Pan et al., 2015). Lastly, technological support includes the availability of support tools (Ardichvili, 2008) and the quality of the service of the support staff (Alali & Salim, 2013; Ho & Kuo, 2013).

Summing up, Table 2 shows the presence of the categories and the dimensions of the typology presented in the studies included in this systematic review.

4. Discussion, conclusions and future research

The results of the systematic review indicate that the Knowledge Sharing Behavior construct is of a multidimensional and multifactorial nature. The typology of factors presented offers an extensive perspective of the knowledge sharing mechanisms in VCOPs and suggests that such behavior depends on the dynamic interplay of a broad range of personal, interpersonal, contextual, and technological factors. The findings allow reaching the following conclusions.

First, KS in VCOPs widely depends on personal factors such as internal motivations, beliefs, and confirmation/disconfirmation of the outcome expectations of the experience of members with community participation.

	Personal					Interpersonal						Contextual			Technological		
	P ₁	P ₂	P ₃	P ₄	P ₅	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	C ₁	C ₂	C ₃	T ₁	T ₂	T ₃
Alali & Salim (2013)					◆											◆	◆
Antonacci et al. (2017)								◆			◆						
Ardichvili (2008)					◆	◆							◆				◆
Ardichvili et al. (2006)														◆			
Assegaff, Kurniabudi & Fernando (2016)	◆				◆												
Barnett et al. (2012)													◆			◆	◆
Barnett et al. (2016)					◆	◆					◆						
Barnett et al. (2014)											◆					◆	
Bourhis & Dubé (2010)													◆				
Cheung, Lee & Lee (2013)			◆		◆												
Chiu, Hsu & Wang (2006)		◆			◆	◆		◆									
Fahey, Vasconcelos & Ellis (2007)					◆	◆											
Fang & Chiu (2010)	◆				◆	◆											
Gallagher & Savage (2013)														◆			
Gammelgaard (2010)						◆							◆				
Harvey et al. (2013)													◆				
Ho & Kuo (2013)					◆											◆	◆
Hou (2015)				◆										◆			
Hurtubise et al. (2016)								◆									
Jeon, Kim & Koh (2011b)					◆								◆				
Jeon, Kim & Koh (2011a)	◆	◆			◆								◆				
Kirkman et al. (2011)										◆			◆				
Lee-Kelley & Turner (2017)		◆		◆	◆												
Li et al. (2007)													◆	◆			
Li (2010)					◆							◆	◆	◆			
Majewski, Usoro & Khan (2011)					◆	◆											
Mason, Castleman & Parker (2008)					◆	◆		◆								◆	
Nistor & Fischer (2012)			◆							◆		◆					
Nistor, Baltes & Schustek (2012b)					◆								◆		◆		
Nistor, Schworm & Werner (2012a)													◆				
Nistor et al. (2014)			◆		◆					◆		◆	◆		◆		
Paasivaara & Lassenius (2014)					◆		◆					◆	◆				
Pan et al. (2015)																◆	
Retna & Tee (2011)				◆			◆						◆				
Seba, Rowley & Lambert (2012)						◆	◆						◆			◆	
Shaari, Bakri & Rahman (2015)	◆																
Thang et al. (2011)					◆			◆					◆			◆	

	Personal					Interpersonal						Contextual			Technological		
	P ₁	P ₂	P ₃	P ₄	P ₅	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	C ₁	C ₂	C ₃	T ₁	T ₂	T ₃
Tseng & Kuo (2014)	◆				◆			◆									
Usoro & Majewski (2011)					◆	◆		◆									
Usoro et al. (2007)						◆											
Wei et al. (2018)	◆				◆												
Xu et al. (2015)									◆		◆						

(P) Personal factors: (P₁) Helping behaviors; (P₂) Need for affiliation; (P₃) Expertise; (P₄) Self-directed learning; (P₅) Beliefs and outcome expectations. (I) Inter-personal factors: (I₂) Leadership; (I₁) Expert status; (I₃) VCOP empowerment; (I₆) Relational structure of the VCOP. (C) Contextual factors: (C₁) Community (as context); (C₂) Parent organization; (C₃) Cultural context. (T) Technological factors: (T₁) Individual factors; (T₂) Technical factors; (T₃) Environmental factors.

Table 2. Treatment of KSB in the studies on VCOP (categories and dimensions)

In fact, altruistic and pro-community behaviors emerge as precursors of KS that prevail over external motivations such as obtaining material incentives or improving personal reputation. With regard to beliefs, the members share their knowledge when they expect positive consequences (e.g. competence development or improvement of their professional network), when they perceive pressure social towards KS, and when they believe that their knowledge can help others (perception of self-efficacy). Ultimately, the intention to continue sharing knowledge depends on the satisfaction of the members with the information quality and the practical usefulness of the shared knowledge, the reciprocity of the exchanges, and their capacity to help others with their knowledge.

Secondly, in the sociotechnical and sociocultural context of VCOPs, personal elements converge in a complex network of interpersonal relations that is crucial to KSB. In addition, prior studies reveal a relation of mutual influence among the personal and interpersonal factors. In the same vein, Fang and Chiu (2010) consider trust in members as an antecedent of altruism, whereas trust in managers of the community is a key determinant of pro-community behavior. Likewise, the existence of personal ties increases altruistic behaviors and the perception of the self-efficacy of one's knowledge to help others, such that personal relations intervene decisively in the construction and development of the community. Li (2010) argues that organizations should be aware of the influence of personal networks in KSB and, therefore, they should promote mechanisms for creating and maintaining strong professional networks. Regarding the leaders, besides generating trust, they exert a key function aligning participation with institutional goals (especially in formal communities), regulating and facilitating participation of members and promoting their commitment.

Thirdly, the results support the prominent role of the contextual factors as a key determinant of KSB in VCOPs. Accordingly, institutional policies (e.g. regulations, procedures, and values), Human Resources policies (e.g. systems of acknowledgment and promotion), and corporate leadership style are key elements in the creation of a knowledge sharing culture. This culture acts as a KSB facilitator to the extent that it promotes and values participation and has the support of the leaders of the organization. Contrariwise, participation in the VCOP has a deep transformative potential in the individual culture which, in turn, is transferred to its institutional and social environment of reference (Hou, 2015; Ardichvili et al., 2006; Li, 2010).

Fourthly, as part of the institutional culture, the empowerment of the members and of the community itself grants a special relevance to VCOPs in the creation of a culture of participation and commitment of its members to individual and organizational improvement. At the individual level, VCOPs demand and generate participation dynamics that promote a proactive attitude toward learning in contexts strongly mediated by technology. At the community level, the collective awareness of the organizational relevance of VCOPs (empowerment of the community) encourages participation and significantly increases its influence in institutional outcomes. Therefore, KS in VCOPs requires the members to adopt a proactive, committed, and responsible role in the individual and collective learning process, allowing them to become agents of change and to promote their competitiveness and that of their organization. The transformative potential of VCOPs resides, therefore, in transcending their nature as a social learning system to become a lever for social and organizational change.

Fifthly, the use of social media (such as Twitter or Facebook), digital means (such as forums, wikis, intranets, or video conference platforms), or other emerging technologies such as the *Immersive Virtual Worlds (IVW)*, is

leading to the creation of VCOPs that transcend the boundaries of time and space of traditional communities and generate new forms of participation, learning, and collaboration.

The new typology presented in this paper allows identifying the factors involved in KSB in VCOPs and knowing how they are organized and how they relate to each other. In the academic or institutional sphere, the results can be used to generate instruments and assessment processes of KSB. In addition, in institutional settings, the structure of factors can be used as a guide to promote learning ecosystems that favor the appearance of emerging communities or that support formal communities.

Lastly, although there is increasing interest, there is still a limited number of studies on the influence of cultural aspects in KSB, so it is considered a future line of research of great relevance in this field. In addition, future research should address the transformative potential of participation in VCOPs in the cultural elements of different organizational and social contexts.

References

- Alali, H., & Salim, J. (2013). Virtual communities of practice success in healthcare sector. *Applied Mechanics and Materials*, 411, 950–953. <https://doi.org/10.4028/www.scientific.net/AMM.411-414.950>
- Antonacci, G., Fronzetti Colladon, A., Stefanini, A., & Gloor, P. (2017). It is rotating leaders who build the swarm: Social network determinants of growth for healthcare virtual communities of practice. *Journal of Knowledge Management*, 21(5), 1218–1239. <https://doi.org/10.1108/JKM-11-2016-0504>
- Ardichvili, A. (2008). Learning and knowledge sharing in virtual communities of practice: Motivators, barriers, and enablers. *Advances in Developing Human Resources*, 10(4), 541–554. <https://doi.org/10.1177/1523422308319536>
- Ardichvili, A., Maurer, M., Li, W., Wentling, T., & Stuedemann, R. (2006). Cultural influences on knowledge sharing through online communities of practice. *Journal of Knowledge Management*, 10(1), 94–107. <https://doi.org/10.1108/13673270610650139>
- Assegaff, S., Kurniabudi, K., & Fernando, E. (2016). Impact of extrinsic and intrinsic motivation on knowledge sharing in virtual communities of practices. *Indonesian Journal of Electrical Engineering and Computer Science*, 1(3), 619–626. <https://doi.org/10.11591/ijeecs.v1.i3.pp619-629>
- Barnett, S., Jones, S. C., Bennett, S., Iverson, D., & Bonney, A. (2012). General practice training and virtual communities of practice - A review of the literature. *BMC Family Practice*, 13(1), 87. <https://doi.org/10.1186/1471-2296-13-87>
- Barnett, S., Jones, S. C., Bennett, S., Iverson, D., & Robinson, L. (2016). A virtual community of practice for general practice training: A preimplementation survey. *JMIR Medical Education*, 2(2), e13–e13. <https://doi.org/10.2196/mededu.5318>
- Barnett, S., Jones, S. C., Caton, T., Iverson, D., Bennett, S., & Robinson, L. (2014). Implementing a virtual community of practice for family physician training: A mixed-methods case study. *Journal of Medical Internet Research*, 16(3), e83. <https://doi.org/10.2196/jmir.3083>
- Bicchi, F. (2011). The EU as a community of practice: foreign policy communications in the COREU network. *Journal of European Public Policy*, 18(8), 1115–1132. <https://doi.org/10.1080/13501763.2011.615200>
- Bolisani, E., & Handzic, E. (Eds) (2015). *Advances in Knowledge Management: Celebrating Twenty Years of Research and Practice*. Springer, Heidelberg. <https://doi.org/10.1007/978-3-319-09501-1>
- Bolisani, E., & Scarso, E. (2014). The place of communities of practice in knowledge management studies: a critical review. *Journal of Knowledge Management*, 18(2), 366–381. <https://doi.org/10.1108/JKM-07-2013-0277>
- Bourhis, A., & Dubé, L. (2010). «Structuring spontaneity»: Investigating the impact of management practices on the success of virtual communities of practice. *Journal of Information Science*, 36(2), 175–193. <https://doi.org/10.1177/0165551509357861>
- Brown, J. S., & Duguid, P. (1991). Organizational learning and communities of practice: Towards a unified view of working learning and innovation. *Organization Science*, 2(1), 40–57. <https://doi.org/10.1287/orsc.2.1.40>
- Castells, M. (1996). *The Information Age: Economy, Society and Culture, Volume I: The Rise of the Network Society*. Blackwell.
- Cheung, C. M. K., Lee, M. K. O., & Lee, Z. W. Y. (2013). Understanding the continuance intention of knowledge sharing in online communities of practice through the post-knowledge-sharing evaluation processes. *Journal of the American Society for Information Science and Technology*, 64(7), 1357–1374. <https://doi.org/10.1002/asi.22854>
- Chiu, C.-M., Hsu, M.-H., & Wang, E. T. G. (2006). Understanding knowledge sharing in virtual communities: An integration of social capital and social cognitive theories. *Decision Support Systems*, 42(3), 1872–1888. <https://doi.org/10.1016/j.dss.2006.04.001>

- Davenport, T. H., & Prusak, L. (2000). *Working Knowledge*. Harvard Business School Press.
- Fahey, R., Vasconcelos, A. C., & Ellis, D. (2007). The impact of rewards within communities of practice: A study of the SAP online global community. *Knowledge Management Research & Practice*, 5(3), 186–198. <https://doi.org/10.1057/palgrave.kmrp.8500140>
- Fang, Y. H., & Chiu, C. M. (2010). In justice we trust: Exploring knowledge-sharing continuance intentions in virtual communities of practice. *Computers in Human Behavior*, 26(2), 235–246. <https://doi.org/10.1016/j.chb.2009.09.005>
- Fishbein, M., & Ajzen, I. (2015). *Predicting and changing behavior: The reasoned action approach*. Routledge.
- Gallagher, S. E., & Savage, T. (2013). Cross-cultural analysis in online community research: A literature review. *Computers in Human Behavior*, 29(3), 1028–1038. <https://doi.org/10.1016/j.chb.2012.09.011>
- Gammelgaard, J. (2010). Knowledge retrieval through virtual communities of practice. *Behaviour & Information Technology*, 29(4), 349–362. <https://doi.org/10.1080/01449290903548406>
- Harvey, J.-F., Cohendet, P., Simon, L., & Dubois, L.-E. (2013). Another cog in the machine: Designing communities of practice in professional bureaucracies. *European Management Journal*, 31(1), 27–40. <https://doi.org/10.1016/j.emj.2012.07.008>
- Hernández-Soto, R., Rodríguez-Medina, J., & Gutiérrez-Ortega, M. (2020). Trust and knowledge sharing in a transdisciplinary community of practice: a convergent parallel case study. *Revista Latinoamericana de Tecnología Educativa*, 19(2), 47–63. <https://doi.org/10.17398/1695-288X.19.2.47>
- Hildreth, P., Kimble, C., & Wright, P. (2000). Communities of practice in the distributed international environment. *Journal of Knowledge Management*, 4(1), 27–38. <https://doi.org/10.1108/13673270010315920>
- Ho, L. A., & Kuo, T. H. (2013). How system quality and incentive affect knowledge sharing. *Industrial Management & Data Systems*, 113(7), 1048–1063. <https://doi.org/10.1108/IMDS-01-2013-0015>
- Hou, H. (2015). What makes an online community of practice work? A situated study of Chinese student teachers' perceptions of online professional learning. *Teaching and Teacher Education*, 46, 6–16. <https://doi.org/10.1016/j.tate.2014.10.005>
- Hurtubise, K., Rivard, L., Héguay, L., Berbari, J., & Camden, C. (2016). Virtual knowledge brokering: Describing the roles and strategies used by knowledge brokers in a pediatric physiotherapy virtual community of practice. *Journal of Continuing Education in the Health Professions*, 3(6), 186–194. <https://doi.org/10.1097/CEH.0000000000000101>
- Jeon, S., Kim, Y. G., & Koh, J. (2011a). An integrative model for knowledge sharing in communities-of-practice. *Journal of Knowledge Management*, 15(2), 251–269. <https://doi.org/10.1108/136732711111119682>
- Jeon, S.-H., Kim, Y.-G., & Koh, J. (2011b). Individual, social, and organizational contexts for active knowledge sharing in communities of practice. *Expert Systems with Applications*, 38(10), 12423–12431. <https://doi.org/10.1016/j.eswa.2011.04.023>
- Kirkman, B. L., Mathieu, J. E., Cordery, J. L., Rosen, B., & Kukenberger, M. (2011). Managing a new collaborative entity in business organizations: Understanding organizational communities of practice effectiveness. *Journal of Applied Psychology*, 96(6), 1234–1245. <https://doi.org/10.1037/a0024198>
- Kirkman, B. L., Rosen, B., Tesluk, P. E., & Gibson, C. B. (2004). The impact of team empowerment on virtual team performance: The moderating role of face-to-face interaction. *Academy of Management Journal*, 47(2), 175–192. <https://doi.org/10.5465/20159571>
- Lampel, J., & Bhalla, A. (2007). Let's get natural: The discourse of community and the problem of transferring practices in knowledge management. *Management Decision*, 45(7), 1069–1082. <https://doi.org/10.1108/00251740710773916>
- Lee-Kelley, L., & Turner, N. (2017). PMO managers' self-determined participation in a purposeful virtual community-of-practice. *International Journal of Project Management*, 35(1), 64–77. <https://doi.org/10.1016/j.ijproman.2016.09.014>
- Li, W. (2010). Virtual knowledge sharing in a cross-cultural context. *Journal of Knowledge Management*, 14(1), 38–50. <https://doi.org/10.1108/13673271011015552>
- Li, W., Ardichvili, A., Maurer, M., Wentling, T., & Stuedemann, R. (2007). Impact of Chinese culture values on knowledge sharing through online communities of practice. *International Journal of Knowledge Management*, 3(3), 46–59. <https://doi.org/10.4018/jkm.2007070103>
- Majewski, G., Usoro, A., & Khan, I. (2011). Knowledge sharing in immersive virtual communities of practice. *VINE*, 41(1), 41–62. <https://doi.org/10.1108/03055721111115548>
- Mason, C., Castleman, T., & Parker, C. M. (2008). Socio-technical factors influencing channel use for knowledge-sharing in regional SME networks. *International Journal of Knowledge Management Studies*, 2(3), 303–319. <https://doi.org/10.1504/IJKMS.2008.018794>

- McDermott, R., & Archibald, D. (2010). Harnessing your staff's informal networks. *Harvard Business Review*, 88(3), 82–89.
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & The PRISMA Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine*, 6(7), e1000097. <http://doi.org/10.1371/journal.pmed.1000097>
- Nistor, N., Baltés, B., Dascălu, M., Mihăilă, D., Smeaton, G., & Trăușan-Matu, Ș. (2014). Participation in virtual academic communities of practice under the influence of technology acceptance and community factors. A learning analytics application. *Computers in Human Behavior*, 34, 339–344. <https://doi.org/10.1016/j.chb.2013.10.051>
- Nistor, N., Baltés, B., & Schustek, M. (2012b). Knowledge sharing and educational technology acceptance in online academic communities of practice. *Campus-Wide Information Systems*, 29(2), 108–116. <https://doi.org/10.1108/10650741211212377>
- Nistor, N., & Fischer, F. (2012). Communities of practice in academia: Testing a quantitative model. *Learning Culture and Social Interaction*, 1(2), 114–126. <https://doi.org/10.1016/j.lcsi.2012.05.005>
- Nistor, N., Schworm, S., & Werner, M. (2012a). Online help-seeking in communities of practice: Modeling the acceptance of conceptual artifacts. *Computers & Education*, 59(2), 774–784. <https://doi.org/10.1016/j.compedu.2012.03.017>
- Nonaka, I. (2007). *The knowledge-creating company*. *Harvard Business Review*, 85(7-8), 162-171.
- Paasivaara, M., & Lassenius, C. (2014). Communities of practice in a large distributed agile software development organization - Case Ericsson. *Information and Software Technology*, 56(12), 1556–1577. <https://doi.org/10.1016/j.infsof.2014.06.008>
- Pan, Y., Xu, Y. C., Wang, X., Zhang, C., Ling, H., & Lin, J. (2015). Integrating social networking support for dyadic knowledge exchange: A study in a virtual community of practice. *Information & Management*, 52(1), 61–70. <https://doi.org/10.1016/j.im.2014.10.001>
- Retna, K. S., & Tee, P. N. (2011). Communities of practice: Dynamics and success factors. *Leadership & Organization Development Journal*, 32(1), 41–59. <https://doi.org/10.1108/01437731111099274>
- Seba, I., Rowley, J., & Lambert, S. (2012). Factors affecting attitudes and intentions towards knowledge sharing in the Dubai Police Force. *International Journal of Information Management*, 32(4), 372–380. <https://doi.org/10.1016/j.ijinfomgt.2011.12.003>
- Shaari, R., Bakri, N., & Rahman, A. A. (2015). Antecedents of knowledge sharing behavior among nurses: Towards research agenda. *Procedia - Social and Behavioral Sciences*, 171, 635–641. <https://doi.org/10.1016/j.sbspro.2015.01.171>
- Thang, S. M., Hall, C., Murugaiah, P., & Azman, H. (2011). Creating and maintaining online communities of practice in Malaysian Smart Schools: Challenging realities. *Educational Action Research*, 19(1), 87–105. <https://doi.org/10.1080/09650792.2011.547724>
- Triandis, H. C. (1980). Values, Attitudes, and Interpersonal Behavior. *Nebraska Symposium on Motivation*, University of Nebraska Press.
- Tseng, F.-C., & Kuo, F. Y. (2014). A study of social participation and knowledge sharing in the teachers' online professional community of practice. *Computers & Education*, 72, 37–47. <https://doi.org/10.1016/j.compedu.2013.10.005>
- Uso, A., & Majewski, G. (2011). Intensive knowledge sharing: Finnish Laurea lab case study. *VINE*, 41(1), 7–25. <https://doi.org/10.1108/030557211111115520>
- Uso, A., Sharratt, M. W., Tsui, E., & Shekhar, S. (2007). Trust as an antecedent to knowledge sharing in virtual communities of practice. *Knowledge Management Research & Practice*, 5(3), 199–212. <https://doi.org/10.1057/palgrave.kmrp.8500143>
- Wei, W., Wang, J., Chen, X., Yang, J., & Min, X. (2018). Psychological contract model for knowledge collaboration in virtual community of practice: An analysis based on the game theory. *Applied Mathematics and Computation*, 329, 175–187. <https://doi.org/10.1016/j.amc.2018.01.053>
- Wenger, E. (1999). *Communities of practice. Learning, meaning, and identity*. Cambridge University Press.
- Wenger, E., McDermott, R., & Snyder, W. (2002). *Cultivating communities of practice: A guide to managing knowledge*. Harvard University Press.
- Xu, W. W., Chiu, I. H., Chen, Y., & Mukherjee, T. (2015). Twitter hashtags for health: Applying network and content analyses to understand the health knowledge sharing in a Twitter-based community of practice. *Quality and Quantity*, 49(4), 1361–1380. <https://doi.org/10.1007/s11135-014-0051-6>