HETS Online Journal
Volume 3, Issue 1: October 2012

Community, Practice, and Domain Behaviors, and the Moderator Influence of Information Technology among global Communities of Practice: A Meta-Analysis

Saldaña, Jacqueline [1]

[1] Ana G. Méndez University System- Florida Campus

Abstract

The theory of Communities of Practice (CoPs) emerged in the middle 1990s through the work of Etienne Wenger and other contemporary authors (Wenger, 2004; Wenger, McDermott, & Snyder, 2002; Wenger & Snyder, 2000). Domain, practice, and community are the main dimensions of CoPs, each with a set of defined behavioral dynamics that allow communities of learners to develop continued growth and sustainability. Professional associations and educational institutions are using online CoPs to engage industry and academia in contributing with innovative solutions to everyday problems. The knowledge management theory has defined groups that meet to produce knowledge solutions in response to common interests as invisible colleges, epistemic communities, learning communities, and CoPs. A meta-analysis of 84 research designs dated from 2000 to 2011, and representing 18 geographic areas in more than 20 industries, demonstrated that professional CoPs manifest distinctive behaviors in all CoP structural dimensions as described by Wenger et al. (2002). Reflective collaboration (e.g., community), sense of common purpose (e.g., practice), and innovation, creativity, and solutions to everyday problems (e.g., domain) are the behaviors present with more frequency among global CoPs. The moderator role of information technology for collaboration and knowledge creation is evident in the observed CoP behaviors and

dynamics of this meta-analysis. The use of technologies to promote CoPs creates new challenges for organizations, which will be providing more technological services and support to the diverse CoPs' memberships.

Introduction

The theory of Communities of Practice (CoPs) emerged in the middle 1990s through the work of Etienne Wenger and other contemporary authors (Wenger, 2004; Wenger, McDermott, & Snyder, 2002; Wenger & Snyder, 2000). Wenger (2000) coined the communities of practice term to explain how professional groups seek common solutions for organizational innovation. The definition of CoP, according to Wenger (et al., 2002), is "…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" (p. 4). Wenger (2000) used observations from technical clubs in motor companies to explain how practitioners self-organize to practice continuous learning through collegial relationships (Mintzberg, 2003) or the standardization of professional skills. Domain, practice, and community are the main dimensions of CoPs, each with a set of defined behavioral dynamics that allow communities of learners to develop continued growth and sustainability. Community, practice, and domain are the structural dimensions of CoPs (Wenger, 2004; Wenger et al., 2002; Wenger & Snyder, 2000).

Professional associations and educational institutions are using CoPs to engage professionals and students alike to contribute with innovative solutions to everyday problems. The advent of Web 2.0 technologies provide contemporary CoPs with expanded opportunities for global collaboration and innovation. CoPs present ideal conditions for group innovation because they usually possess culturally diverse participants, interdependent collaborative networks, and opportunities for shared leadership and participation, all elements of high-

performing teams (West, 2009). Challenges emerge in relation to dynamics of *institutionalization* (Wenger et al., 2002) or the alignment of community goals to organizational objectives. The social structure of CoPs loses part of its organic nature when organizations try to legitimize the role of CoPs through policies or guidelines.

Within the context of more formal networks, institutionalization (Wenger et al., 2002), information technology (IT) (Moreno, 2001), and managerial support (Siebert, Mills, & Tuff, 2009) constitute additional variables with influence over CoPs' social structures. Most professional CoPs use IT platforms to facilitate distance communication. New technologies such as the Internet are interactive in nature, contributing to exchanging roles, developing mutual discourse, and facilitating flexible communication that overcomes spatial and geographical distance (Everett & Allbritton, 1995). Positive experiences with technologies influence the way community participants develop shared meaning and common language (Hawk, Zheng, & Zmud, 1999). Technologies have shown to enable knowledge sharing and serve as repository of knowledge and vehicle for effective dissemination of new practices (Abdullah, Sahibudin, Alias, & Selamat, 2005; Griffith, & Sawyer, 2006; Hew & Hara, 2007). A meta-analysis of 84 research designs dated from 2000 to 2011, and representing 18 geographic areas in more than 20 industries (see Appendix A), demonstrated that professional CoPs manifest all of the behavioral dimensions described by Wenger et al. (2002).

Theoretical Background

Theories about groups of individuals who meet to produce solutions and knowledge in response to common interests, problems, and passions exist before Wenger et al., (Wenger, 2004; Wenger, McDermott, & Snyder, 2002; Wenger & Snyder, 2000) proposed the theory of CoPs.

Scholars tried to define communities of practitioners as invisible colleges (Price & Beaver, 1966; Crane, 1972), epistemic communities (Adler and Haas, 1992), and learning communities (Marshall & Peters, 1985). Theoretical frames one each of these concepts share characteristics that Wenger identified as part of the social structures of CoPs.

Invisible Colleges

Price (1966) and Crane (1971) theorized about groups of scholars and researchers collaborating through informal communication channels to share specific interests and goals usually related to scientific advancement. Price (1966) suggested the idea of invisible colleges as organizational strategy to produce and steward organizational knowledge. Invisible colleges relate directly with groups of intellectuals in the 16th century Europe sharing scientific knowledge to address common concerns, and which became a platform for the foundation of the Royal Society of the United Kingdom. Price conducted bibliometric studies to prove that groups of practitioners with similar interests develop naturally tendency to collaborate through social interaction; an activity that influences group cognitive intelligence (Goel, Johnson, Junglas, & Ives, 2010). Members in invisible colleges organize by choice of specialty and direct activities to specific community goals within conditions of closeness, communication, and dissemination of ideas (Casey & McMillan, 2008).

Invisible colleges' theories (Price & Beaver, 1966; Crane, 1971) show parallelisms with Wenger's CoP concept (2004). Both invisible colleges and CoPs can trace part of their theory ideas of (a) social diffusion of knowledge (Crane, 1972; Khun, 1996) and Schon's (1989) reflective practices theories. Invisible colleges, like CoPs, exhibit social networks, centered leadership, peripheral groups of collaborators, and connectedness that overcomes geographic and spatial segregation (Zuccala, 2005). Invisible colleges emerge during critical times in which the

need for immediate expertise is necessary to advance science or to share resources to overcome mutual challenges, although they can acquire certain visibility when they get organized (Zuccala, 2005).

Epistemic Communities

Adler and Hass (1992) defined epistemic communities that emerge independently from governmental spheres and have direct influence on policy-making. Epistemic communities are professional networks composed of subject matter experts (SMEs) with competence over specific domains (Adler & Haas). Epistemic communities share normative beliefs, value-based social dynamics, analysis to solve problems, shared notions of validity of knowledge, shared practice domain, and a set of common practices. Epistemic communities comprise of members developing professional identity, sharing knowledge, networking, and mentoring younger professionals. Epistemic communities follow a social exchange of three distinctive activities, (a) assessment of uncertainty, (b) interpretation of the conditions, (c) and institutionalization of new practices (Adler & Haas).

Adler and Haas (1992) reported that a classic example of epistemic community is the first group of experts that raised concern about the polluting quality of chlorofluoro-carbons (CFCs) after 1972. Observations form an ecological epistemic community alerted about the damage of CFS' over ozone and its future effect in global warming. Efforts culminated in the 1989 Basel Convention, resulting in worldwide commitment to reduce CFCs. Most countries have enacted public policy to protect the environment from the dangers of CFC (e.g., United States Clear Air Act of 1990). Adler and Haas associated the role of epistemic communities to policy innovation and dissemination of new practices. Dunlop (2009) clarified that learners in epistemic

communities seek knowledge from multiple derivations to build solutions at their own pace. Epistemic communities negotiate knowledge, perception of risks, and procedural lawfulness (Stauffacher & Moser, 2010)

Learning Communities

A learning community is a group of individuals who share a common practice and develop a right understanding in the appropriate context to learn from each other (Brower, 2003). Senge (as in Namjaidee, Manmart, Apichatwallop, & Peerasit, 2010) defined that members of a learning community possess five characteristics, (a) mental models, (b) shared vision, (c) personal mastery, (d) collective learning, and (e) system thinking. Senge, among other instructors at the Massachusetts Institute of Technology, promoted the learning community model as a way to create knowledge sharing organizations (Senge, 1993; Koffman & Senge, 1991). Senge (1993) described the process of a learning community, first, as a shared vision that emerges from numerous places but last guides a learning vision. This shared vision drives thinking, acting, and sustaining dialogue to integrate diverse viewpoints. When members of a community build this shared vision, they develop a sense of empowerment that enables good decisions through the design of learning processes.

Senge (1993) adjudicated the origin of knowledge-sharing organizations to the work of Japanese firms with total quality management (TQM) systems, especially those related to thinking and acting at many levels, a learning collaborative style among high technology companies in Japan. In these, the increased integration of thinking and acting promoted an evolution in quality management evidenced by the works of Nonaka and Nishiguchi (2001) about knowledge creation in the organization and the way companies help channel workers' tacit

knowledge into explicit or formal knowledge. For these Japanese thinkers, knowledge is not simply a cognitive construct but expertise inseparable from the pragmatism of action.

Learning communities have evolved into powerful creative networks successful in companies such as Toyota and in the work with high-politics situations, such as the leaders of the Guatemala Guerilla (Arthur, Day, Jaworski, Jung, Nonaka, Scharmer et al., 2002). Learning organizations create a space of innovation similar to the Japanese concept of Ba, a shared context that arises from interactions and relationships (Nonaka & Nishiguchi, 2001). Learning communities see knowledge as an organizational element that cannot be managed (Scharmer, 2007). Learning communities operate under the assumptions of the (a) behavioral level of reality, (b) the behavioral level of social reality, and (c) the deep tacit level of knowledge. Theorists call this last one the "blind spot" (Arthur, et al., 2002, Scharmer, 2007), or a deeper space from which a systems of individuals can create new paradigms.

CoP Emergent Theory

Theory of CoPs has foundation on Jean Lave's ideas of situated learning (1991). Situated learning proposed that organizational knowledge happens in circumstances of social interaction, in which the cognitive abilities of participants interrelate with group social structure, environmental context, and previous knowledge of participants (Goel, Johnson, Junglas, & Blake, 2010). Dynamics of situated learning involve practitioners, activities, cognition, meaning, knowing, and learning. Communities of practitioners bring a pre-existent socially and culturally structured world that becomes an analytical process of learning. Shared learning activities promote identity based on skills and expertise of participants.

Situatedness refers to the interaction of situation, agent, and cultural context (Rohlfing, Rehm, & Goecke, 2003). Lave (1991) proposed that learning is a process of *interpretive view*, in which individuals negotiate meaning, language becomes a social activity (as opposed of simply the medium to transmit ideas), and personal interests appeal to cognition. Situatedness is not a physical location, but a relationship of individuals and their environment, which, in turn, influences those individuals' process of learning and developing. Lave (1991) recommended the study of situated learning as a way to master apprenticeship among communities of practitioners.

Brown & Duguid (1998) developed theories on CoPs deriving interpretation from Orr's ethnography of copier repair technicians. Julian Orr (as in Budery, 1998) proposed that individuals from a same profession, such as communities of technicians, share characteristics inherent to their craft. This sameness provides cohesion to occupational communities. Through observation and interviews to equipment technicians in Xerox Corporation, Orr declared in 1996 (as in Budery) that technicians become work cultures in which individuals share similar interests and values. Participants in work communities can transcend their organizational settings and establish links with practitioners from other organizations.

Industries related to knowledge markets such as engineering, technology, advanced electronics, computer software, biotechnology, and health care are using the power of professional collaboration as a knowledge management strategy with the objective of developing competitive advantage through the creation and transfer of knowledge. Organizations that understand and promote learning structures in which professional groups co-create through the natural environment of networking develop learning loops, continual innovation, and quick adoption of practices (Stuart, 1995, 2006). Wenger et al., (Wenger, 2004; Wenger, McDermott,

& Snyder, 2002; Wenger & Snyder, 2000) proposed a social structure based on three main components of domain, practice, and community.

Wenger and Lave (1991) challenged organizations with the concept that acquiring knowledge is more than the accumulation of factual information. Knowledge is an epistemic experience in which personal preferences and organizational situatedness have a defining influence during the learning process. Organizational members with same interests, expertise, and craft become members of a community, develop collective culture, and participate in the acquisition, production, and dissemination of knowledge (Contu & Willmot, 2003). This process happens within the context of knowledge activities, shared practice, and cultural expression such as activities, stories, and artifacts. Observations with different CoPs or apprenticeships such the Yucatan midwives, US Navy, Alcoholics Anonymous, and other trade workers (e.g., tailors, meat-cutters) drove these first theories on communities of practice.

Lave and Wender(1991) theorized the concept of legitimate peripheral participation or circumstances of mutual participation. As community participants increase their expertise, they increase their participation on central activities. Wenger et al., (2004) coined the term *legitimate peripheral participation* to explain relationships of apprentices and masters, different levels of expertise, and the development through time of cultural artifacts and identities that emerge from socio-practices inside a community of practitioners. Peripheral participation reflects community participants' trajectories of learning, identity, social forms, and relationships of power (Lawless, 2008). Peripherality is a movement throughout a community from low to high expertise and from discrete to more intensive participation as opposed to a central location. Although CoPs represent multiple opportunities for participation, most members of CoPs remain passive

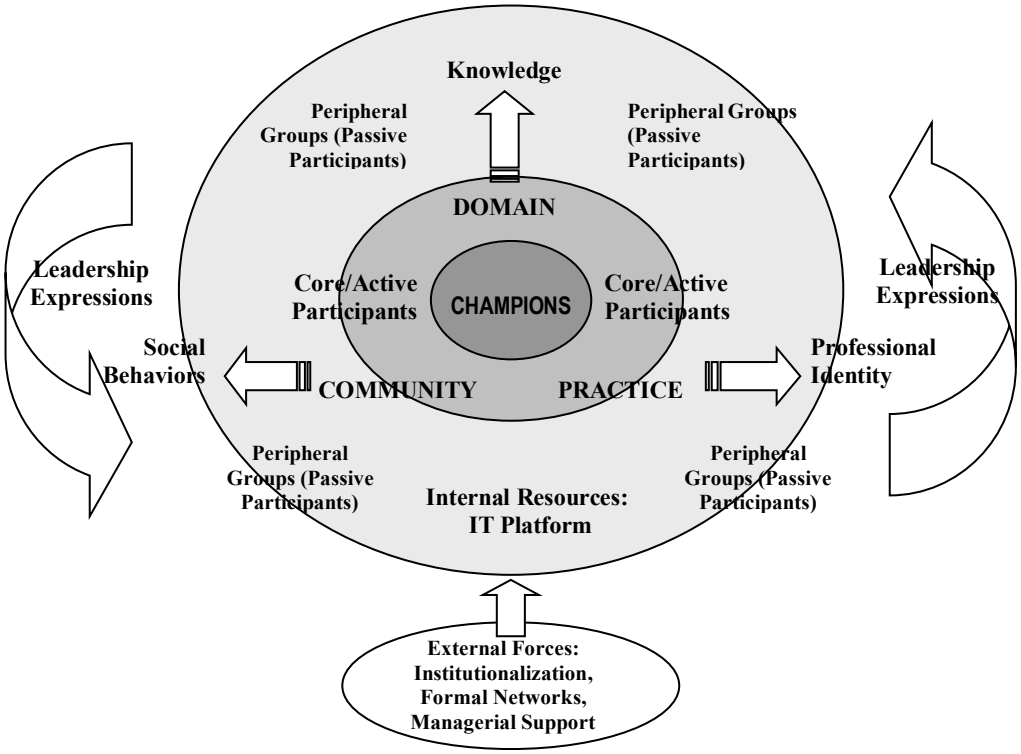
participants, as observers and users of practices but without producing knowledge (Wenger et al., 2002). A lesser amount of members are active and involved directly to opportunities to conform epistemic realities.

CoP Literature Meta-Analysis (2000-2011)

A meta-analysis of 84 research designs dated from 2000 to 2011, and representing 18 geographic areas in more than 20 industries (see Appendix A), demonstrated that professional CoPs manifest all of the behavioral dimensions described by Wenger et al. (2002). The areas represented in the meta-analysis with more frequency were the United States (35.7%), United Kingdom (17.9%), multinational companies (11.9%), and Canada (6%). Industries in the emergent CoP research with more frequency were education (39.3%), technology (17.9%), consulting firms (7.1%), and health care (4.8%).

Using as base the core and peripheral groups diagram described by Wenger et al. (2002, p. 57), figure one incorporates the elements of domain, practice, and community in relation to CoP structural dimensions and external forces observed during this meta-analysis. Emergent literature demonstrated the force that technology and institutionalization exercise over CoP behavioral dynamics. After this analysis, researcher obtained a deeper insight into what are specific behaviors and characteristic manifest as part of the development of professional CoPs in contemporary organizations, specifically in the dimensions of community, practice, domain, and the moderator role of IT.

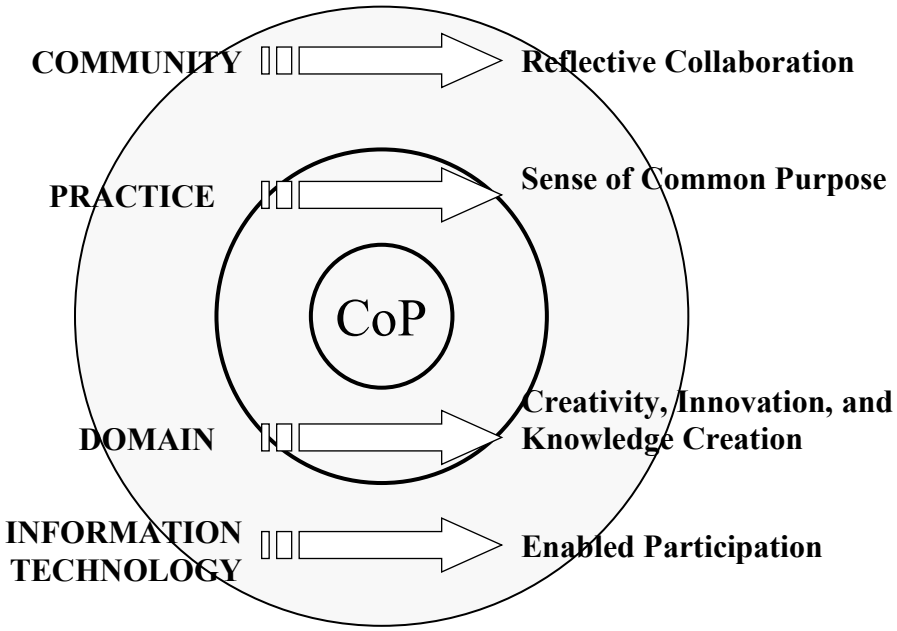
Figure 1: CoP Social Structure Observed from Meta-Analysis



Discussion of Results

Results of a CoP emergent literature meta-analysis (2000-2010) evidenced the manifestation of the three elements identified by Wenger (2000) as main components of a CoP by the presence of behaviors and expressions in the three categories of community, practice, and domain (see Figure 2). Information technology manifested as an enabler for community participation.

Figure 2: CoP Meta-Analysis Outcomes



Community Behaviors

CoPs are loose and informal structures; self-managed groups related by collegiality and lack of business purpose even if organizations purposely establish these communities. The emergence of today's global markets propitiates geographically dispersed communities, in which technology acquires special significance. Most contemporary CoP members share Websites, communicate regularly by e-mail, or use teleconferences to communicate. As CoPs increase membership, subgroups, and peripheral groups emerge and strong local identities emerge (Wenger et al., 2002). The community component represents the roles and activities a CoP performs regularly. The element of community serve as the social learning structure in which

members build relationships, bring their individual perspectives, and help each other to solve problems. Is in the community that members embed roles and activities, legitimizing the role of the CoP through specific outputs and overlap with other fields.

During the analysis of 84 research designs, CoP members operating under real-life circumstances produced five main community activities (see Table 1): (a) reflective collaboration (19%), (b) professional networking (16.9%), (c) mutual engagement and connectivity (12.2%), (d) long-term relationships (9.2%), and (e) embedded communication paths (7%). Additional community behaviors observed with less frequency were group autonomy, existence of peripheral and informal groups, and peer-to-peer collaboration (5.6% each), self-organization (4.2%), teamwork (3.5%), face-to-face contact (2.8%), and improved communication, low conflict, participation, and reduced silos effect (2.1% each).

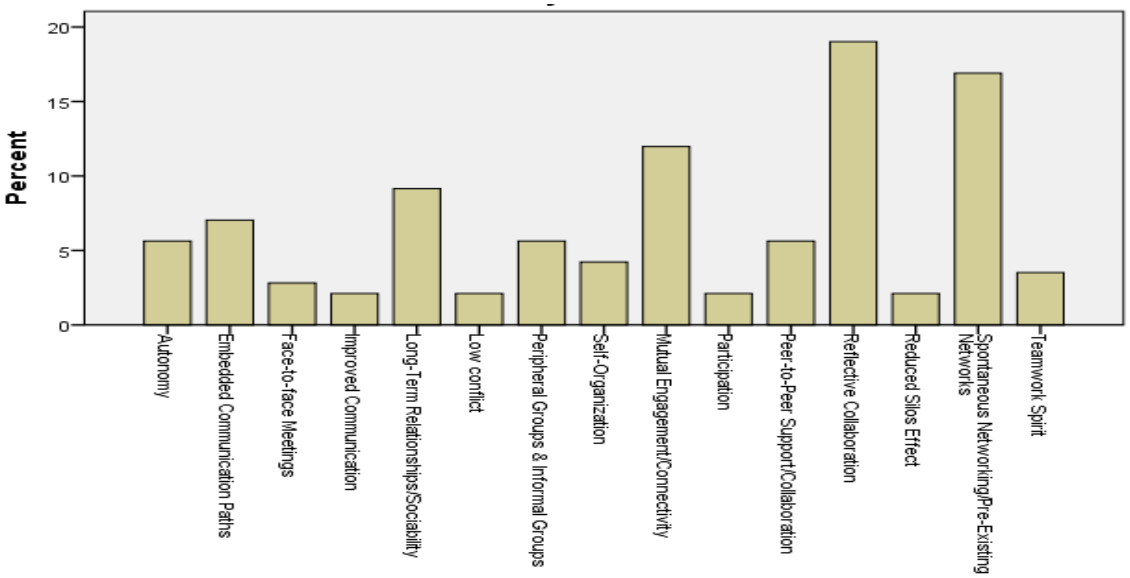
Table 1: CoP Community Behaviors (2010-2011)

Community Behaviors	**Frequency**	**Percentage**	**Cumulative Percent**
Reflective Collaboration	27	19.0	19.0
Spontaneous Networking/Pre-Existing Networks	24	16.9	35.9
Mutual Engagement/Connectivity	17	12.2	48.1
Long-Term Relationships/Sociability	13	9.2	57.3
Embedded Communication Paths	10	7.0	64.3
Autonomy	8	5.6	69.9
Peripheral Groups & Informal Groups	8	5.6	75.5
Peer-to-Peer Support/Collaboration	8	5.6	81.1
Self-Organization	6	4.2	85.3
Teamwork Spirit	5	3.5	88.8
Face-to-face Meetings	4	2.8	91.6
Improved Communication	3	2.1	93.7
Low conflict	3	2.1	95.8
Participation	3	2.1	97.9
Reduced Silos Effect	3	2.1	100.0
Total	142		

From these community behaviors, reflective collaboration was the community behavior repeated with more frequency during the study of CoPs' main components (see Figure 3).

Reflective collaboration manifested with more frequency in the fields of education (58.7%) and consulting firms (11.8%), appearing mostly in the United Kingdom (33%), the United States (28.7%), and multinational companies (14.4%) (see Appendix B).

Figure 3: Community Behaviors Frequency (2010-2011)



Reflective Collaboration. Open source interactive systems' CoPs have adopted reflective collaborative approaches to explore how software developers perceive usability problems, process constraints, identify difficulties to process innovation (Bach & Carroll, 2010), and attain collective growth knowledge (Lee & Cole, 2003) within the open source culture. Work experiences within open source practitioners demonstrated that CoPs could use reflective collaboration as tool to expand the scope of domain, establish a better framework to guide social capital, and understand decisions that involve power structure analysis.

Blanton and Stylianou (2009), on the other hand, found that reflective collaboration develops a stronger culture of professional development because practitioners had the opportunity to reflect routinely about how to use practice, artifacts, and discipline content. Reflective collaboration challenged educators to shift to an inward mental status, connect deeper

with problems and solutions (Blanton & Stylianou, 2009), improve their practice and expertise (Kisiel, 2010; Wright, 2007), improve their use of available technologies (Murugaiah, Azman, (Ya'acob, & Thang, 2010), make new cognitive connections (Vavasseur & MacGregor, 2008), and learn informally and experientially (Viskovic, 2006).

Focus group interviews among music and art CoPs demonstrated that participants could both reflect and articulate experiences to find pluralistic viewpoints and facilitate social interaction that results in opportunities for innovation (Dabback, 2010). Reflective collaboration provides opportunity to develop a deeper insight about the different perspectives conforming traditional and novel practices. Moreover, practitioners can use reflective collaboration to develop awareness of CoP dimensions (e.g., negotiated enterprise, mutual engagement, shared repertoire) and development lifecycle (Carey, Smith, &Martin, 2009). Collective reflection supports also decision-making skills necessary to develop practices and policies to support shared enterprise. Leadership decision-making paradigms such as the Vroom-Yetton or the normative decision-making model (Nahavandi, 2009) address the importance of involving followership in the prescription of solutions as opposed to following a traditional unilateral leadership approach.

Practice Behaviors

Practice represents working models, practices, and professional culture (Wenger et al., 2002). Practice organizes knowledge in a way understandable by community members, creating joint enterprise, stories, professional behaviors, and working methods. Nicholls (2006) stated that explicit and implicit knowledge lack value unless practitioners of a field develop shared methods to deliver such knowledge. The emergent literature of CoPs demonstrated that sense of common

purpose and negotiated enterprise are main expressions of contemporary communities of learners (see Table 6). Wenger et al., (2002) described how practitioners develop an increased sense of "craft intimacy" (p. 122). Members from a same community of professionals share commonalities that increase their sense of belonging and develop feelings of common ground.

The analysis of 84 research designs reported that CoP members operating under real-life circumstances produced five main practice activities (see Table 2): (a) sense of common purpose (14.3%), (b) negotiated enterprise (13.2%), (c) shared stories (13.2%), (d) professional identity (12%), and (e) production of cultural artifacts (11%). Other CoP practice behaviors present in less frequencies (see Figure 5) are artifacts (11%), shared stories (10%), organizational policies (8%), embedded cultural identification and professional roles (6% each), egalitarian culture and shared repertoire (4% each), culture transfer (3%), and cultural sensitivity (2%).

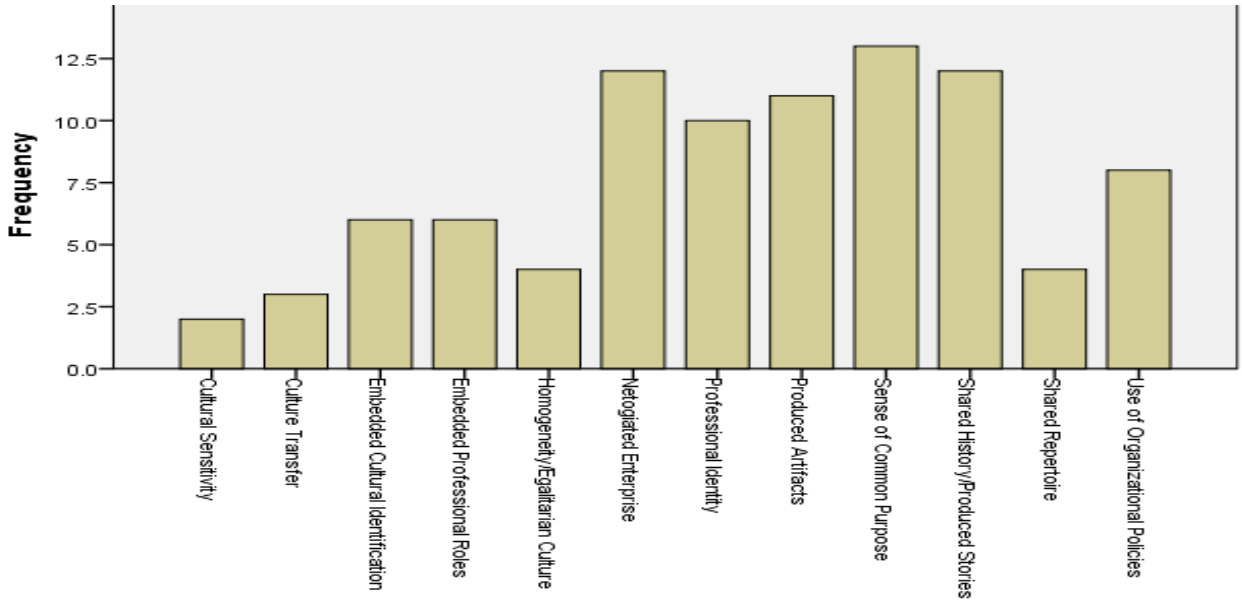
Table 2: CoP Practice Behaviors (2010-2011)

Practice Behaviors	Frequency	Percentage	Cumulative %
Sense of Common Purpose	13	14.3	14.3
Negotiated Enterprise	12	13.2	27.5
Shared History/Stories	12	13.2	40.7
Professional Identity	11	12.0	51.6
Produced Artifacts	10	11.0	63.7
Use of Organizational Policies	8	8.8	72.5
Embedded Cultural Identification	6	6.6	79.1
Embedded Professional Roles	6	6.6	85.7
Homogeneity/Egalitarian Culture	4	4.4	90.1
Shared Repertoire	4	4.4	94.5
Culture Transfer	3	3.3	97.8
Cultural Sensitivity	2	2.2	100.0
Total	91		

From these practice behaviors, sense of common purpose was the community behavior repeated with more frequency during the study of CoPs' structural dimensions (see Figure 4).

Sense of common purpose manifested with more frequency in the fields of education (58.7%) and consulting firms (11.8%), appearing mostly in the United States (35.3%), and Australia, New Zealand, Spain, and United Kingdom with equal distribution of averages (11.7 each) (see Appendix C).

Figure 4: Practice Behaviors Frequency (2010-2011)



Sense of Common Purpose. Among other authors, Price (2005) stated that sense of common purpose is the element of cohesion within CoP members who share understanding about a practice or subject matter field. Sense of common purpose in organizational structures provides workers with common meaning and familiarity necessary to increase participation and accountability (Adkins, Bartczak, Griffin, & Downey, 2010; Topousis, Murphy, & Holm, 2008). Allen (as cited in Bowen, 2010) emphasized that common purpose is an essential step for CoPs to emerge organically (Bowen, 2010). Studies with Six Sigma leaders demonstrated that groups

could understand and fulfill expectations of effectiveness when members could articulate rationally their common goals, increasing their ability to share knowledge (Bowen, 2010).

CoP members developed deep sense of common identity by combining their personal, social, or professional concerns (Buckley & Du Toit, 2009) and through their mutual passion for a field of knowledge or professional enterprise (Hayes & Fitzgerald, 2009; McElya, 2011). Members of studied CoPs indicated that belonging to a community of practitioners nurtured among them feelings of belonging and made them "part of a family" that decides to remain in collaboration for long time (Hayes & Fitzgerald). Educators who worked together for extended periods created a purposeful integration of members and community elements (Linehan, 2010; Wright, 2007) and felt more innovative and productive even if they operate with limited resources (Price, 2005), and regardless of participants' gender (Tomcsik, 2010).

Sense of common purpose increased feelings of accountability among CoP members, facilitating shared practice (De Palma & Teague, 2008). The willingness to work as part of the group became a driving sentiment from which members derived fulfillment and comfort (Tomcsik, 2010). De Palma and Teague recommended keeping dialogue alive as activity essential for CoP sustainability. Members of educational CoPs used dialogue to utter community affirmations reflecting the values and principles of those specific groups (Linehan, 2010) and to overcome the barriers of cultural distance (Yu et al., 2009). Simultaneously, participation, cooperation, and decision-making abilities decreased when common sense of purpose declined in professional CoPs, diminishing as well the quality of outcomes (Gausdal, 2008).

To maintain renovated common sense of purpose, CoP core members should consider that the vision of the community is a prevailing context in which CoP members become increasingly engaged in accomplishing collective goals. Members of the *No Child Left Behind* program used

vision statements to create coherent work frames within complex educational systems (Linehan, 2010). A CoP with a well-aligned vision cultivate stronger relationships that contribute to expand knowledge sharing in different settings, build membership pride (McElya, 2011), and encourage collaborative learning (Mobanagan & Columbaro).

CoP members with increased commitment to the common purpose of the community become usually part of the core or central group (e.g., champions) that produces the majority of the work for the benefit of less active and peripheral groups within a same community (O'Kane). In this environment, knowledge transfer flows better between different active and peripheral groups and manifests in the patterns of mentoring relationships, peer-to-peer guidance, and collaboration that satisfies the cognitive needs of participants (Tomcsik, 2010; Vega & Quijano, 2010).

Domain

Domain, or area of expertise, deals with the CoP dimension related to structural ability to safeguard knowledge. Domain represents a topic, a work specialization, an industry, or a subject matter that matters a group of professionals. Groups of experts operating within socio-technical structures construct epistemic realities from logic, linguistics, contexts, and knowledge (Noriko, 2006). CoPs seem to be fertile ground for creative solutions and innovation (see Table 3).

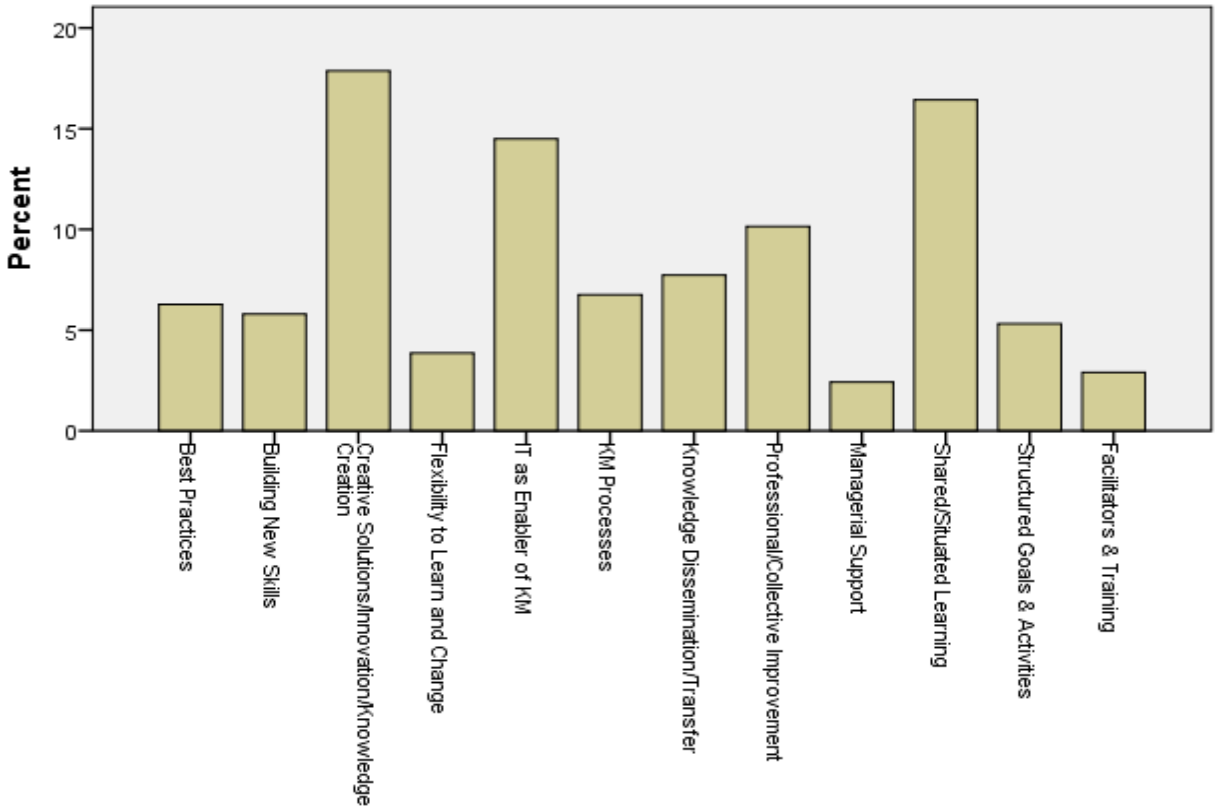
Table 3: CoP Domain Behaviors (2010-2011)

Domain Behaviors	Frequency	Percentage	Cumulative Percent
Creative Solutions/Innovation/Knowledge Creation	37	17.9	17.9
Shared/Situated Learning	34	16.4	34.3
IT as Enabler of KM	30	14.5	48.8
Professional/Collective Improvement	21	10.1	58.9
Knowledge Dissemination/Transfer	16	7.7	66.6
KM Processes	14	6.8	73.4
Best Practices	13	6.3	79.7
Building New Skills	12	5.8	85.5
Structured Goals & Activities	11	5.3	90.8
Flexibility to Learn and Change	8	3.9	94.7
Facilitators & Training	6	2.9	97.6
Managerial Support	5	2.4	100.0
Total	207		

Contemporary scholars of knowledge management (Nonaka & Nishiguchi, 2001) demonstrated that the creation knowledge structures are important to achieve innovation and competitive advantage through examples of global multinational enterprises that achieved efficient knowledge creation, overcoming challenges related to cross-border communication within geographically dispersed memberships. Evolved CoPs showed similar practice phases during their lifecycle development (see Figure 5), including situated learning (14.5%), information technology as enabler for knowledge sharing (10.1%), knowledge dissemination (7.7%), knowledge management processes (6.8%), best practices (6.3%), building new skills (5.8%), structured goals, and activities (5.3%), flexibility to learn and change (3.9%), facilitators and training (2.9%), and managerial support (2.4%). Creativity, innovation, and knowledge creation manifested with higher statistical relevance in the fields of education (39.8%) and technology (17.2%). The outcomes of domain over creativity, innovation, and knowledge

creation were evident in the United States (30.4%), the United Kingdom (17.6%), and South Africa (13.3%) (see Appendix D).

Figure 5: Domain Behaviors and Characteristics Frequency (2010-2011)



CoPs exist as ancillary structures within organizations sustained by volunteer participation. Different levels of participation represent different positions of power but CoPs should be a representation of egalitarian cultures (Yan & Assimakopoulos, 2006). Wenger et al. (2000) warned that the dimension of domain could induce to defective CoPs when individuals demonstrate the legitimacy of the community through exclusivity and arrogance (Wenger et al., 2000). Communities of practitioners can avoid this detrimental pattern of behavior by establishing strategic perspective and values, linking community activities to organizational

goals, offering inspiring vision, practicing shared leadership in decision-making, exposing members to divergent perspectives, and making members accountable for community's reputation.

Creative Solutions, Innovation, and Knowledge Creation. Existing literature demonstrated abundant examples of how CoPs are fertile ground for creative solutions, innovation, and knowledge creation in numerous industries. CoP structures pose with the advantage of a collaborative learning environment in which inventors and end-users join to create, prototype, and test technical innovations (Abdullah, Sahibuasdin, Alias, & Selamat, 2005; Lavoue & George, 2010). The Linux kernel case study is an example of how a group of practitioners can create new products and test their effectiveness. Thousands of volunteers geographically dispersed developed and tested a high-quality software operating system within a community-based progressive knowledge creation network driven by peer-to-peer critic and error-trial efforts (Lavoue & George, 2010). CoPs allowed professional service firms to analyze new practices, identify critical generative elements, combine learning pathways to networks, and promote knowledge-based organizations (Anand, Gardner, & Morris, 2007; Jawitz, 2009). These innovative structures can offer a unique viewpoint regarding professional advancement in which participants can leverage inquiry and expertise (Ash, Brown, Kluger-Bell, & Hunter, 2009; Dabback, 2010) whereas breaking old practice paradigms to learn new practices (Bosa, 2008).

Organized CoPs can promote change in bureaucratic environments such as public health care by promoting entrepreneurial impetus and channeling it into modern tools, radical change, and refined techniques (Bosa, 2008; Elmualim & Govender, 2008). Empirical evidence from longitudinal studies in different industries (from call center organizations to complex innovation working environments) demonstrated that professional CoPs supported the identification of best

practices and creative solutions to everyday problems, enabling an environment of innovation and competitiveness (Corso, Giacobbe, & Martini, A., 2009) for private and public organizations alike (Gambarotto & Cammozzo, 2010). Goldstein and Butler (2010) concluded that CoP structures promote stakeholder-based cooperative models, equipping governmental agencies with more diversified collaborative planning tools. This is only possible within a work frame of open communication and participation. CoP structures in modern organizations challenge managerial enterprise to build organizations adept to nurture innovative perspective, positive attitude, and triple loop-learning (Gambarotto & Cammozzo, 2010).

Members in CoP structures establish learning experience boundaries using the principles of constructivism and hands-on training approaches, effective models for professional training (Hodgkinson-Williams, Slay, & Siebörger, 2008). Monaghan (2007) and O'Kane. Paine, & King, (2008) dwelled on how CoPs provide real-time context from multiple perspectives to expand learning experiences. CoP structures are effective to link knowledge with practice because members engage systematically in cooperation while sharing a repertoire of working methods that they can use cooperatively to innovate (Iverson & McPhee, 2008) in real life. This working environment has proven to be successful for members of a regulated field (such as special education) in establishing practice standards, policies, and change (Linehan, 2010). Nevertheless, these collaborative networks seem to work better among individuals who come from the same culture, field of professional expertise, or similar thinking processes (Lee & Cole, 2003). South African countries are using the concept of CoPs to promote collaborative learning in local communities through higher education efforts (Buckley & DuToit, 2009; Hodgkinson-Williams et al., 2008; Jawitz, 2009).

Members of CoPs develop epistemic parameters that maintain collective meaning. Knowledge creation, creative solutions, and innovation happen in contexts of rich information and membership connectivity, all of which enhances knowledge capabilities (O'Kane et al., 2008). This means that organizations must design working environments recognizing the social aspect of knowledge creation in which members define knowledge strategy, link strategy with operational programs, leverage the different dimensions of CoPs, and give careful attention to organizational context. The challenge of modern management is to create these organizational structures free from the intervention of policymakers (Thompson, 2005), avoiding the constraints of traditional structures while maintaining production control.

Information Technology as Enabler of Domain

The study of CoP emergent literature demonstrated that the third most important element of domain is the role of information technology (IT) in enabling learning environments (see Table 11), after innovative solutions for everyday problems and situated learning. Technology capacitated CoPs to track concept maps, document activities, and created visual language inherent to a content discipline (Akoumianakis, 2009). CoP archives of presentations, best practice case studies, and shared tools function as repositories for content knowledge and proved to be critical in knowledge stewardship (Guldberg & Mackness, 2009). IT bestows collaborative learning because it caters to groups of practitioners multiple communication outlets (e.g., chat rooms, wiki-spaces, blogs), especially useful for knowledge creation amidst groups of practitioners geographically dispersed such the armed forces (Adkins et al., 2010) and multinational companies (Anand et al., 2007). However, research (Akkerman, Petter, & De Laat, 2008; Kasper, Mühlbacher, & Müller, 2008) revealed that some CoP members need face-to-face meetings to reinvigorate enthusiasm. CoP members in multiple industries and countries enhanced

their abilities to create knowledge with support of IT tools and communication outlets, with more relevance in the fields of education (35%), technology (17.2%), and more preeminence in the United States (39.5%) and multinational companies (17.2%) (see Appendix E).

Organizations from numerous industries design their own software to support CoP activities (Akoumianakis, 2009) or explore alternative technologies such as interactive digital television (De Melo, Santos, Ferreira, & Dantas, 2010) as communication platforms. Akoumianakis (2009) alerted that technology offers plethora of communication methods to intensify connectivity among members including instant messengers, virtual worlds, online games, multi-user domains, screening-sharing capabilities, and specific domain languages. Other virtual communication platforms are Web 2.0, Web crossing, and video conferencing technologies (Sarirete & Chikh, 2010). Technology creates a new order of CoP artifacts entitled to satisfy the needs for creation among different groups. Mastering these technology tools contributed to increased participation (Clark, 2010) and self-efficacy (Clark, 2010; Murugaiah, 2010) among virtual CoP members. Corso et al. (2009) defined virtual tools as main motivators to maintain connectivity that boost membership participation, involvement, and commitment. Scarso, Bolisani, & Salvador (2009) denominated the technological dimension as one of the four pillars of CoPs, along with the organizational, cognitive, and economic dimensions.

The use of technologies test the capabilities of organizations interested in establishing CoPs because community stakeholders will need from augmented, customized, and cost-effective technical support to maintain continual negotiated enterprise (Goldstein & Butler, 2010; Mizintseva & Gerbina, 2009). Guldberg and Mackness (2009) indicated how organizations involved in supporting CoPs could monitor members' participation to understand performance

and offer variety of virtual environments. Hew and Hara (2007) studied electronic mailing lists to understand how literacy teachers shared knowledge through virtual communication, types of knowledge, and knowledge flow, discovering that lack of knowledge about technologies and competing communication outlets are main barriers to sustained participation. Mork et al. (2008) found that ability of community participants to access equipment and support are characteristics of successful cross-disciplinary practices. Early adopters of CoP technologies in teacher communities showed more ability to build online networks of professional learning whereas requiring support that is more technical over time **(**Riverin & Stacey, 2007).

Technology expands the capabilities of practitioners for which some school systems have made mandatory for teachers to have free access to Internet, technology tools, and communication technology training (Riverin & Stacey, 2007). The online delivery of professional CoPs is convenient because it allows immediate access to other members, professional expertise, and advice, and cost-effective communication platforms (Vavasseur & MacGregor, 2008). However, the use of technologies supports practice but not the formation of CoP identity (Noriko, 2007). Vavasseur and MacGregor (2008) alerted organizations working with CoPs should not confuse professional identity with the building of technical skills. Findings of Norika research reflected that IT itself is not conducive to knowledge creation unless the elements of socialization, negotiated enterprise, and professional identity are present. Beyond modern IT systems, surveyed CoP members seek primarily for professional advancement, expertise, collegiality, and innovation opportunities.

Conclusion

Wenger (2000) proposed a CoP theory similar to previous gremial groups, such as invisible colleges, epistemic communities, and learning communities. Invisible colleges are groups of scholars and researchers channeling their specific interests and goals into industry advancement, rooted on the 16th century scientific movement in Europe. In modern management, Price (1966) continued this line of thought with studies about practitioners collaborating to industry advancement through social interaction. Crane (1972) produced a book about the capacity of invisible colleges to diffuse knowledge. Kuhn's ideas (1996) about knowledge diffusion are well known in the scientific world, with practitioners identifying anomalies that led to scientific innovation. Invisible colleges share with CoPs some fundamental characteristics, such as core leadership, peripheral groups, and connectedness that overcome geographic and time zone barriers. The development of contemporary CoP (Wenger, 2004; Wenger et al., 2002; Wenger & Snyder, 2000) theory relate the existence of CoPs with developmental stages similar to those present in the traditional life cycle paradigms (e.g., inception, high-growth, and maturity.

Epistemic communities are networks of professionals who possess specific domains and influence policy-making (Adler & Haas, 1992). Members of epistemic communities share professional beliefs and values related to domain competence. Epistemic communities take interest in the betterment of industry and society, promoting the institutionalization of new practices. Professional participants in epistemic communities aim to identify sources and methods to produce and manage knowledge. Like-minded professionals share common characteristics as they master similar practices and possess similar mental models, vision, and system thinking. Senge (1999) associated learning communities to Japanese total quality

management (TQM) philosophies (i.e. Toyota), which attempted to transform organizations into collaborative learning spaces to capitalize on workers' tacit knowledge. Members of learning communities bring with themselves intuition and elements from epistemic understandings and personal experience. Contemporary leadership theories (Cashman, 1998; Scharmer, 2007) recommend intuition and personal mastery as nonconventional strategies to promote innovation.

Wenger et al., (2002) brought the concept of CoP to the attention of modern industries as learning and social structures able to steward knowledge. Theories of situated learning (Lave, 1991) inspired Wenger's vision of CoPs, in which organizations acknowledge that learning happens within a social context and from previous working experiences. The 1990s saw also a proliferation of CoP research in the works of Orr (as in Budery, 1998), and Brown and Duguid (1998). Research with technical groups demonstrated that situation and culture influence cohesion among practitioners. Cultural context provides to the members of the community a common ground for enterprise negotiation, social interaction, and common language and artifacts. As members of the CoP collaborate and communicate, a semantic environment evolves and promotes among members creative ideas to common problems. Wenger recommended organizations to exploit the capabilities of CoPs as if these are innovation assets. Knowledge is an epistemic experience and workers learn and produce better when the organizational culture supports a social learning environment.

A fundamental characteristic of CoPs is the distribution of participant groups. At the core of the community, a smaller group of champions initiate activity whereas peripheral groups and passive participants demonstrate less participation but benefit from new ideas and knowledge. Regularly, level of expertise is the trigger to participation. CoPs rely on the experience of more knowledgeable members to direct activities. In general, members of the CoP develop

professional identity and sense of common purpose. Wenger et al. (2002) defined the basic elements of the CoP as community, practice, and domain. A meta-analysis of 84 research designs dated from 2000 to 2010 and representing 18 different countries in more than 20 industries demonstrated that professional CoPs manifest a specific order of behaviors and characteristics in the dimensions of community, practice, domain, and IT as enabler of collaboration.

In the dimension of community, the behavior observed with more frequency was reflective collaboration. Reflective collaboration is an effective strategy for innovation because it expands the mental capabilities of workers who can identify constraints and opportunities. Practitioners who reflect regularly about procedures and artifacts improve expertise, make new cognitive connections, and learn experientially.

In the dimension of practice, the behavior observed with more frequency was sense of common purpose. Sense of common purpose represents a space of craft intimacy; in which practitioners share common meaning and familiarity and professional identity. Studies reported that sense of common purpose is necessary to build self-organization, values of accountability, motivation, and self-fulfillment. Elements such as vision, leadership, and clear expectations and goals contribute to solidify sense of common purpose.

In the dimension of domain, the behavioral characteristic observed with more frequency was the existence of creative solutions, innovation, and knowledge creation. CoPs demonstrated to be fertile ground for identification of problems, ideation of new processes, prototyping tools and methods, and validation of practice results. Case studies such as those related to open-source software (e.g., Linux) are examples of how CoPs can achieve technical innovation through collaborative trial-error approaches. Organized CoPs members could produce innovation in

private and public organizational environments. The principles of constructivism and hands-on learning common within CoPs are similar to those related to real-time context to expand practice perspective.

It was evident during the literature meta-analysis the role of IT in the maturity and expanded capacities of contemporary CoPs. IT enables the domain element because it serves as repository of emergent knowledge, tracking device for progress, and multi-outlet communication media. Professional organizations design unique software and communication platforms to support the work of specific groups of practitioners. Technology intensifies connectivity among CoP members, although parallel research indicated that face-to-face interaction reinvigorates the enthusiasm of CoP members. The use of technologies to promote CoPs creates new challenges for organizations, which will be providing more IT services and support to the different CoPs' memberships.

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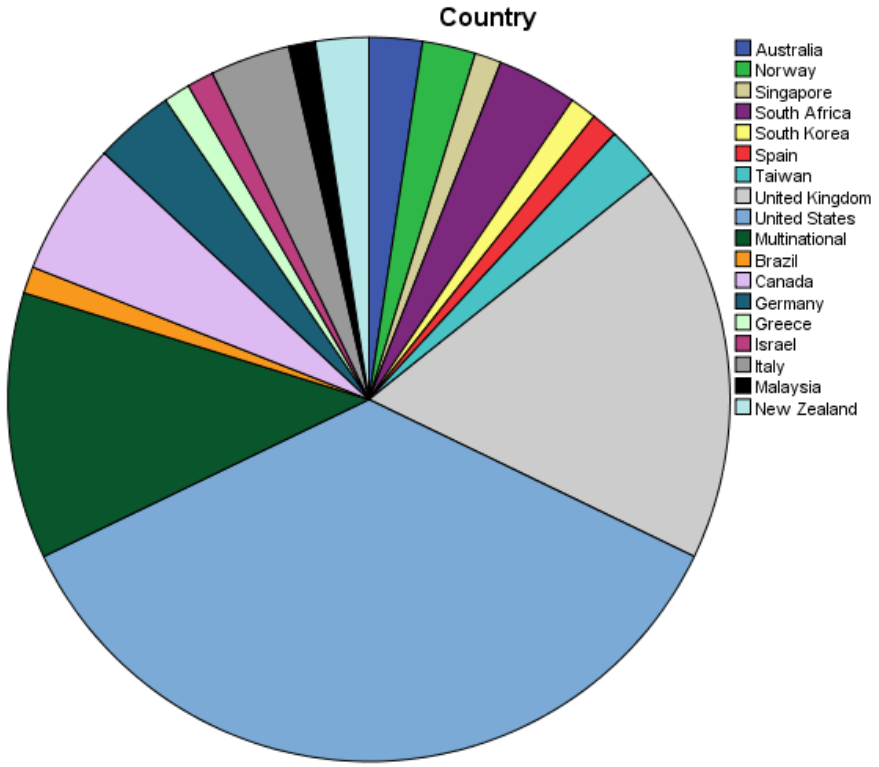
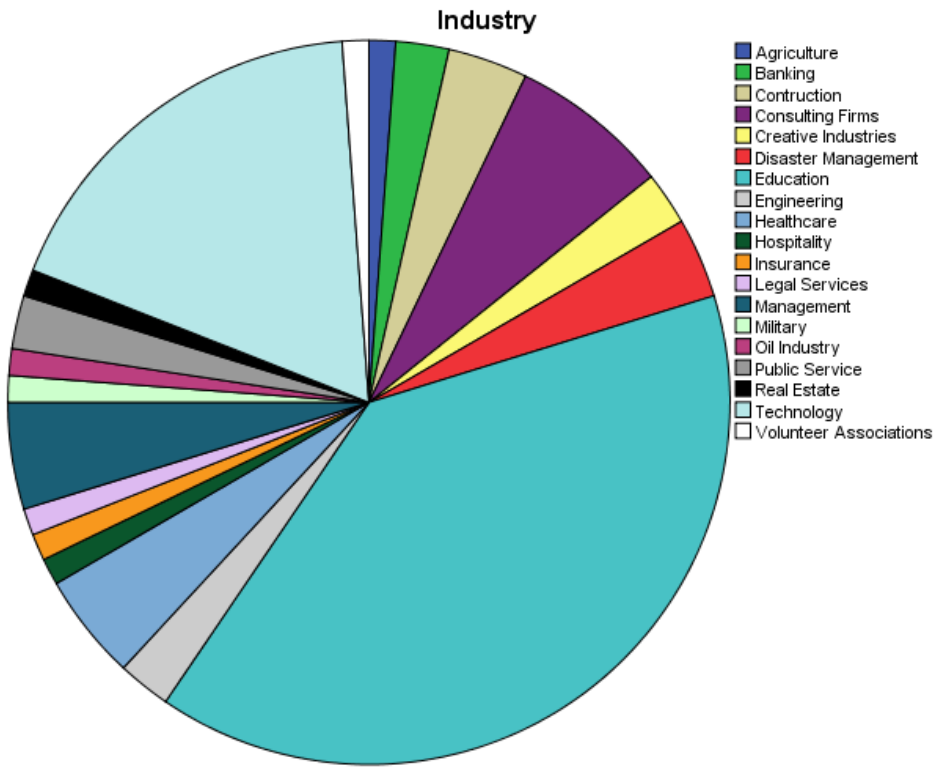
Appendix A: CoP Research Geographic Area and Industry Distribution



INDUSTRY	Canada	Malaysia	New Zealand	Norway	UK	US	MNC	Total
Creative Industries						4.8%		4.8%
Construction							4.8%	4.8%
Education	4.8%	4.8%	9.5%		33%			52.1%
Engineering						4.8%	4.8%	9.6%
Healthcare						4.8%		4.8%
Legal Services						4.8%		4.8%
Technology				4.8%		9.5%	4.8%	19.1%
Total	4.8%	4.8%	9.5%	4.8%	33%	28.7%	14.4%	**100%**



Appendix B: Reflection Collaboration

	COUNTRY								
INDUSTRY	Australia	New Zealand	Norway	Spain	South Africa	UK	US	MNC	Total
Agriculture	5.9%								5.9%
Consulting	5.9%						5.9%		11.8%
Education		11.7%		5.9%	5.9%	11.7%	17.6%	5.9%	58.7%
Engineering							5.9%		5.9%
Healthcare							5.9%		5.9%
Real State			5.9%						5.9%
Technology				5.9%					5.9%
Total	11.8%	11.7%	5.9%	11.8%	5.9%	11.7%	35.3%	5.9%	**100%**

Appendix C: Sense of Common Purpose

Appendix D: Creative Solutions, Innovation, and Knowledge Creation

	COUNTRY								
INDUSTRY	Australia	Canada	Germany	Italy	South Africa	UK	US	MNC	Total
Agriculture	4.3%								4.3%
Construction						4.3%			4.3%
Consulting								4.3%	4.3%
Creative Ind.							4.3%		4.3%
Education		4.3%			9%	9%	17.5%		39.8%
Healthcare			4.3%						4.3%
Management		4.3%					4.3%	4.3%	12.9%
Oil Industry				4.3%					4.3%
Public Service				4.3%					4.3%
Technology					4.3%	4.3%	4.3%	4.3%	17.2%
Total	4.3%	8.6%	4.3%	8.6%	13.3%	17.6%	30.4%	12.9%	**100%**

	COUNTRY											
INDUSTRY	Brazil	Canada	Germany	Greece	Italy	Malaysia	Norway	Singapore	UK	US	MNC	Total
Banking			4.3%									4.3%
Consulting											4.3%	4.3%
Education		4.3%				4.3%		4.3%	9.1%	13%		35%
Engineering											4.3%	4.3%
Healthcare							4.3%					4.3%
Hospitality											4.3%	4.3%
Legal Services										4.3%		4.3%
Management										4.3%		4.3%
Military										4.3%		4.3%
Oil Industry					4.3%							4.3%
Politics										4.3%		4.3%
Technology				4.3%						9.1%	4.3%	17.7%
Various	4.3%											4.3%
Total	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%	9.1%	39.3%	17.2%	**100%**

Appendix E: IT as Enabler of Knowledge Management