Original Article

In Search of Innovative Capabilities of Communities of Practice: A Systematic Review and Typology for future research

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Abstract

The concept of communities of practice has generated considerable debate among scholars of management. Attention has shifted from a concern with the transmission and reproduction of knowledge towards their utility for enhancing innovative potential. Questions of governance, power, collaboration and control have all entered the debate with different theorizations emerging from a wide mix of empirical research. We appraise these key findings through a critical review of the literature. From a divergent range of findings we identify four main ways in which communities of practice enable and constrain innovative capabilities as: (i) enablers of learning for innovation; (ii) situated platforms for professional occupations; (iii) dispersed collaborative environments; and (iv) governance structures designed for purpose. Our conclusion signals the way forward for further research that could be used to improve our understanding of different contextual forms and how they may align with organizations in enabling rather than constraining innovative capabilities.

Key words: Organizational learning, Innovative capabilities, Communities of practice

Introduction

Since the publication of Lave and Wenger's (1991) seminal work on Communities of Practice (CoPs) as sites of situated learning there have been wide ranging debates that have supported, extended, repositioned or conflicted with these original ideas, generating concept reconceptualization and driving theorization. Focusing on the way apprentices learn, Lave and Wenger (1991) demonstrate how learning is the product of the activity, context, and culture in which it is developed and used. Later reformulations by Wenger and Snyder (2000) and Wenger (1998) differentiate CoPs from other network forms in being characterized as self-organizing, informal and self-selecting of both members and leadership (see also, Fox, 2000, p. 853). They define a CoP as a 'group of people informally bound together by shared expertise and passion for a joint enterprise… people in [CoPs] share their learning experiences and knowledge in free-flowing, creative ways that foster new approaches to problems' (Wenger and Snyder, 2000, p. 139-140). Whilst this conceptualization emphasizes common concerns, shared passions and the deepening of knowledge and expertise through ongoing interaction (see also, Wenger et al. 2002), the place of innovation within sites of situated learning remain unclear. Where there have been cognate discussions, the link with innovation is contentious, with competing views on whether CoPs enable or constrain innovative capabilities in organizations. For example, Brown and Duguid (1991) discuss how CoPs in organizational settings contribute to innovation through their flexible structures that constantly adapt to changing circumstances and membership; whereas Ferlie et al (2005) illustrate how professional CoPs can prevent innovation.

Our review aims to contribute to learning and knowing in management and organizations through a critical evaluation of what are often competing and contradictory findings. We commence by defining and conceptualizing innovation and innovative capabilities. The methodology we used for a systematic selection of relevant refereed journal articles is then

outlined prior to a critical review of the literature. Following a summary discussion of the main findings, we present our typology of CoPs and a contextualized framework that aims to serve as a heuristic guide for enhancing organizational innovative capabilities and management learning (see also Cunliffe, 2002; Swart and Kinnie, 2007 Knoppen et al. 2011; Contu, 2014; Mariano and Casey, 2015).

Defining and conceptualizing innovation

Innovation has been defined and interpreted in a variety of ways. Dawson and Andriopoulos (2014), for example, refer to the use of ideas to solve problems, create new products and services, to develop processes and to improve the way activities are carried out; whereas Van de Ven (1986) view innovation as 'the development and implementation of new ideas by people who, over time, engage in transactions with others in an institutional context' (p. 104). This definition provides a strong link to CoPs as a vehicle for sharing new ideas and, in the context of this review, is the one we have adopted as being most petinent.

Although CoPs have generally focused on reinforcing local ties (Hydle et al. 2014), innovation often comes about from exchanging knowledge and learning not only within but also across organizational boundaries developing connections that may be geographically and temporally dispersed (Assimakopoulos, 2007), requiring stakeholders to forge socio-political relations and to come to a collective sense of understanding in framing new ideas (Gish and Clausen, 2013). As Nooteboom (2000) argues, it is often at the junctures of these connections that organizations seek to enhance their innovative capability.

At this point we can make an important distinction between *innovative capabilities,* i.e. the process of building relationships and sharing expertise in the creation of new ideas that support the development of new processes and products (Hagedoorn and Duysters, 2002) and *innovation,* i.e. the outcomes in 'new product introductions, technology patents, sales

generated from new products' (Subramaniam and Youndt, 2005, p. 453). By *innovative capabilities* we refer to the activities around innovation processes that reinforce and encourage the generation of new and useful knowledge based on previous knowledge (Kim, 1997) and the activities that support the translation of creative ideas into new potential innovations. As a new frontier that is becoming increasingly important to enhancing the innovative capabilities of organizations, we map out in more detail below the key issues and themes which have emerged from our critical analysis of the extant literature. But first we outline the methodology employed in our selection of scholarly material.

Methodology

Drawing upon Pittaway et als' (2004) methodology, the review identifies key words; formulates search strings; reviews (with the purpose of refining inclusion and exclusion criteria); engages in a quality assessment of identified articles; and provides a critical interpretive synthesis of the materials selected.

Identification of key words

We identified a number of key words, generated through brainstorming activity (Pittaway et al. 2004). Each author produced a list of key words based on their existing knowledge, from which a refined set of key words was agreed in the development of our search strings (see Table 1).

Search strings

We assembled the key words into suitable search strings for the systematic review. These were entered into the following databases: *Business Source Complete, Emerald Management, Science Direct* and *SCOPUS,* covering a full range of disciplines in the social sciences. The search was limited to peer-reviewed journals. There was a high degree of variation in the search results due to the different search options offered by each database. We decided, given

the review's focus, we would limit our search to articles with 'CoP' and 'innovation' in the title/abstract. For example, the root search string 'Communit* of practice AND Innovat*' yielded 3,587 papers across a range of disciplines, including linguistics, computing and education, as well as management. Additional keywords were added in order to refine the root search string using AND OR Boolean search operators to produce a combination of search strings (see Table 1). We combined the search criteria with limiters, such as restricting the subject area, depending on the functionality of each database (these included searching the years from Lave and Wenger's seminal work in 1991 to 2015).

Inclusion/exclusion criteria

The citations identified as a result of the above were then reviewed according to inclusion and exclusion criteria. Inclusion criteria included whether words such as CoP and/or innovation were used in the title or abstract of the article; exclusion criteria included use of terms such as personal networks, occupational communities and networks of practice where CoPs were not mentioned (see Table 1).

Insert Table 1 about here

Our approach generated 340 articles (1991-2015) that were cross-referenced to identify and remove any duplications (generating 282 papers). These were further reduced to 114 papers by excluding articles in subjects not directly related to CoPs and innovation in organizations, namely: agriculture, general education (non-HE/non-post experience, learning, training), higher education, environmental (environmentalism, sustainability, social communities), healthcare, lifestyle, marketing, public administration, pure science and technology, quality management, tourism, and welfare.

Quality assessment

The remaining articles were then read to assess quality and relevance to our concerns (Oxman, 1994). Each article was appraised for quality using a standardized set of questions (see Table 1) and graded as 'well covered', 'adequately addressed' or 'not adequately addressed'. This process excluded a further 40 papers where CoPs were not the main focus; for example, Kodama (2002) distinguishes 'strategic communities' from 'CoPs', focusing on the former and only briefly referring to CoPs. The final 72 articles form the focus of our analysis, with material from other sources (e.g. innovation literature) being used as appropriate.

Synthesis

Our literature review adopts Critical Interpretive Synthesis (CIS) as a means of conducting an analytical synthesis of literature in a specific field (Dixon-Woods et al. 2006). CIS enables a more interpretive approach, allowing us to capture the complexity of data from a diverse set of subject areas and differs from more 'aggregative' approaches to conducting a systematic review, which usually compile and summarize the main findings of a body of evidence (Annandale et al. 2007). We undertook a detailed reading of all 72 articles, progressively identifying recurrent themes in a critical comparative analysis. We used these themes to capture the key phenomena contained within the articles, which informed the development of our emerging typology. Category formulation, revision and reanalysis in revising an earlier version of this paper supported the building of our contextualized framework (see Figure 1).

Limitations

Any decisions on inclusion and exclusion criteria limit the extent of the review and CIS. Full transparency is not achievable due to the interpretive nature of the critical data analysis.

Innovative capabilities of CoPs: A critical review

Our critical review identified divergent findings from which four main CoP pathways (with some overlap) to achieving innovative capabilities in organizations were distilled: (i) as venues for practice-based learning that facilitate the sharing and management of knowledge, this in turn can serve as a mechanism for enhancing innovative capability (enablers of learning for innovation); (ii) as 'situated platforms for professional occupations', typically hierarchical, protectionist and closed to cognizant stakeholders outside of the professional group in question - can also act as power-political inhibitors of collaboration that constrain innovation; (iii) as 'dispersed collaborative environments', referring to those communities found within and across organizations which support the development of close collaborative relationships built on trust and reciprocity (socio-contextual enablers for generating social capital and promoting knowledge exchange for enhanced innovative capabilities); (iv) where CoPs are purposefully developed and fashioned through designed governance, via infrastructural support (such as appropriate reward structures and the use of brokers, sponsors, and champions) to stimulate collaborative activities and enhance organizational innovative capabilities. We also found significant evidence that if these designed forms of enabled governance become too regulatory (reducing the space for autonomy and spontaneity), then the managerial paradox arises whereby those very attempts to promote innovation can act as constraints on the very process that they seek to support. The research used to generate our typology and contextual frame for examining the relationship between CoPs and innovative capability are summarized in Table 2 and discussed in turn below.

Insert Table 2 about here

CoPs as enablers of learning for innovation

Early research (Lave and Wenger, 1991) focused on the ways in which people learn through socially situated activities and how these activities emerge and develop within a culture and across contexts (Lampel and Bhalla, 2007) over time. This social theory of learning draws attention to the ways in which these processes of learning contribute to knowledge acquisition in social settings (Brown and Duguid, 1991). Brown and Duguid (1991), in (re)assessing the relationship between work, learning and innovation, conclude that significant learning and innovation is generated and takes place within practice-based CoPs. They draw upon Orr's (1990) ethnographic study of Xerox photocopy repairmen, showing how the latter's ability to repair photocopiers was based upon the use of storytelling to share tacit knowledge; as these 'war stories' were passed around they generated new knowledge within the community. Brown and Duguid (1991) and Orr (1990; 1996) showed that there can be a disparity between espoused and actual practice; a reliance upon espoused or canonical practices can be to the detriment of non-canonical practices, i.e. getting the actual job done.

A failure to recognize the importance of non-canonical practices might go hand-in-hand with a failure to recognize the importance of CoPs in supporting organizational learning and innovative capability. Brown and Duguid (1991) argue for a practice-based perspective which sees learning as a bridge between work and innovation, claiming that organizations must close the gap between canonical and non-canonical practice.

Aubry et al. (2011) suggest that CoPs act as learning mechanisms for constructing new knowledge from established practices, as well as disseminating existing practices from the 'master to the newcomers' (p.51). Similarly, Sense and Clements (2006) refer to CoPs as 'situated learning opportunities' which contribute to learning and innovative capability. For

Chen and Tseng (2011), situated learning is essential for enhanced innovative capability, and membership of CoPs enables effective knowledge transfer by providing access to other local 'experts'. Anand et al. (2007) concur that CoPs support learning and knowledge-based innovation, and note the role of 'key actors' in embedding these forms of activities and championing the knowledge-based innovations generated within CoPs. The process of learning together, collaboratively solving situated work-related problems, can create CoPs which might also help solve problems for customers (Dougherty, 2001) through building communities of 'user-innovators' (Baldwin et al. 2006, p. 1291).

In a similar vein, Heiskanen et al. (2010) posit that such learning communities (Juniper and Moore, 2002; Cara, 2009) support knowledge transfer in user-led innovation (see also, Morrison et al. 2000; Jeppesen and Frederiksen, 2006; Terwiesch and Yi, 2008; Dahlander and Frederiksen, 2012), which are arguably CoPs (Pattinson and Preece, 2014). This research provides some evidence that knowledge spill-overs can occur across CoPs, for example as a consequence of open innovation (Chesbrough, 2003), and that this can boost organizations' learning and strengthen their ability to commercially exploit new ideas in the form of innovations (Brown and Duguid, 1991).

CoPs as situated platforms for professional occupations

Forms of power and control are important in helping us to understand situated learning (Veenswijk et al. 2010), and take centre stage as status hierarchies are reinforced and bolstered by professional CoPs that seek to legitimize their place and position in society. Ferlie et al. (2005) argue that CoPs operating within professional occupations such as doctors differ from the non-professional occupations studied by Lave and Wenger (1991) as they are typically highly institutionalized – although Lave and Wenger examined the master-apprentice relationship they have been heavily criticized for failing to address issues of

conflict and power (Hamilton, 2011). Ferlie et al. (2005) identify how the Royal Colleges in the UK medical profession act as self-regulatory and unidisciplinary machinery, controlling entry into and exit from the professional groups, setting and examining training programs, validating medical research, and enforcing professional standards. Knowledge not only resides in these CoPs (Mudambi and Swift, 2011), but it is also closely regulated and controlled (see for example, Lange et al. 2008). As Hamilton (2011, p. 20) posits: 'Issues of power and conflict go hand in hand with legitimacy – who can participate, and in what practices? Legitimacy may not be just about participation but about how practice is renegotiated'. In other words, conditions of legitimacy delineate the ability to generate knowledge in professional communities.

McGivern and Dopson (2010) suggest that in such epistemic or professional CoPs, professional credibility can enhance individuals' ability to influence beyond their status. In their study of biomedical innovation they show how 'knowledge objects' (i.e. physical objects or abstract concepts which exist as temporary anchors or bridges between overlapping communities) were transformed at the micro-level through the practices and relative power of local communities, which were in turn influenced by wider epistemic, organizational and governmental rules about knowledge generation. The most powerful group (academic medical professors) were seen to produce epistemic objects that reflected forms of credibility valued in their wider community, thus bolstering their professional status. With regard to legitimate peripheral participation, Tempest (2003) warns against making unsubstantiated assumptions about where knowledge resides in organizations, urging caution when using the power-laden notions of 'novice' and 'expert' or 'master' and 'apprentice' (see also Hamilton, 2011). Amidon (1998) discusses the learning and innovation which occurs in communities where individuals from diverse backgrounds collaborate and share information; in such circumstances, practice-sharing is rooted in the need to affirm a positive professional identity

(Tagliaventi et al. 2010). Garrety et al. (2004) take a similar view, indicating that, at least in technical projects, CoPs can draw on expertise from different professional groups. It has also been noted that there is very little in the literature on the political and organizational dynamics associated with embedding CoPs in organizations (Hotho et al. 2014).

Professional CoPs can also create barriers to improved innovative capabilities because they are unidisciplinary, i.e. their members belong to one particular profession and seal themselves off from other professional groups in order to protect their domain of knowledge and professional identity (Ferlie et al. 2005). These communities are often highly institutionalized and bureaucratic, leading to the further reinforcement of members' professional identity and to the ring-fencing of knowledge (Harvey et al. 2013). CoPs based on professional occupations support learning and innovative capability *within* the community, but often block it externally (Ferlie et al. 2005) and frequently rise above organizational loyalty (Roy and Sivakumar, 2011).

Du Plessis (2008) suggests that CoPs represent learning entities, where the transfer of tacit knowledge into explicit knowledge becomes a critical resource for innovation. She also argues that in competing for jobs people use their knowledge to set them apart from other applicants, thereby keeping their knowledge 'close to home', and are less inclined to share it with others unless there is an incentive to encourage sharing. In small firms the 'mind set' is often one of 'knowledge is power', hampering knowledge sharing and the development of fully collaborative CoPs (Du Plessis, 2008).

CoPs as dispersed collaborative configurations

Collaboration has been argued to provide many benefits to organizations, including gaining access to new markets and enabling them to extend their 'reachability' in increasing new talent or expertise (Bertels et al. 2011) and supporting collaboration at the front end of

innovation (Koen et al. 2014). Although the early literature primarily viewed CoPs as mechanisms to support internal connections (Sakkab, 2002), recently it has been argued that they act to moderate the relationship between dispersed collaboration and tacit knowledge transfer (Bertels et al. 2011), essential constituents of innovative capabilities. In this way, CoPs can cut across a firms' boundaries and allow knowledge to flow more effectively between them (Lee and Williams, 2007; Snow et al. 2011), suggesting that collaboration can become focused on (for example) 'open innovation' approaches (Chesbrough, 2003; Allee and Taug 2006).

Hsiao et al. (2006) support the view that situated learning in CoPs is important for innovation, noting that 'capability-based knowledge' (i.e. knowledge generated from practitioners' work activities) is acquired through the process of 'learning by doing' and is supported by such communities. Knowledge is shaped through the dynamic interaction between experts' practices and the work context and cannot be taken outwith practices by transferring it from one location to another as artefacts, nor can it be shared as 'individual cognition' (ibid, p. 1292). Hsiao et al. (2006) cite Orlikowski (2002, p. 253), who contends that knowledge is a type of 'capability', and therefore its transfer involves a developmental process of people's competences, so as to enact 'actionable practices' in a specific context.

Brown and Duguid (2001) distinguish between 'sticky' and 'leaky' knowledge. Sticky knowledge refers to an organization's internal knowledge that is difficult to disseminate internally. Leaky knowledge refers to knowledge that passes outside of the boundaries of an organization, which is often viewed as undesirable. For Brown and Duguid (2001), an organization's knowledge base is not only internal but also draws on its external embeddedness; what is more, knowledge can flow out of an organization more easily than it moves within it. This 'sticky and leaky' distinction has affinities with Cohen and Levinthal's

(1990) concept of ‘absorptive capacity’, which sees the ability to exploit external knowledge as a critical component of innovative capability. An organization’s absorptive capacity is its ability to recognize the value of external information, assimilate it and then to apply it to commercial advantage. This suggests that inter-organizational CoPs can play an important role in supporting knowledge management and innovative capabilities (Knoppen et al. 2011) by facilitating the transfer and sharing of tacit knowledge (Moon et al. 2011; Soekijad et al. 2004.

Two other important features identified in the literature are trust and the development of social capital (Autio et al. 2008). Social capital relies on a social network of relationships, and is summed up by Field (2008, p. 1) in two words: ‘relationships matter’. Connections, developed over time, enable individuals to work together to achieve things they could not achieve in isolation, or that could only be achieved alone with great difficulty or at an extra cost (Nahapiet and Ghoshal, 1998). According to Lesser and Storck (2004), a cohesive community can act as an engine for the development of social capital, decreasing the learning curve, increasing responsiveness to customer experiences and increasing innovative capability (see also Coakes and Smith, 2007; Landry et al, 2002). So called ‘knowledge spill-overs’ in CoPs rely on the build-up of social capital, which enhances trust and the exchange of knowledge (Autio et al. 2008). Trust thereby plays a significant role in collaboration, providing the necessary conditions for knowledge sharing (Scarbrough et al. 2004) and successful open innovation (Chesbrough, 2003).

Amin and Roberts (2008) discuss the issue of ‘co-location’ in relation to different types of collaborative innovation. They argue that differentiation is required between the varieties of ‘knowing in action’ that CoPs represent. They suggest that the use of the term ‘CoP’ has become imprecise as it is being increasingly applied to a variety of social practices in a variety of collaborative settings. They believe that such variability in the use of the term is

unhelpful and glosses over important differences in practice. They offer a CoP typology which attempts to differentiate between the varieties of 'knowing in action' that have traditionally been assumed to be reliant on spatial proximity. Four distinct groupings suited to the undertaking of different types of innovation are identified, comprising: 'task-craft' based CoPs associated with customized/incremental innovation; 'professional' communities with radical or incremental innovation (which are bound to institutional or professional rules, where radical innovation is generated through the use of multiple CoPs); 'epistemic' or highly creative CoPs, which are involved in 'high energy' radical innovations; and virtual learning communities (Smeds and Alvesalo, 2003) that support both incremental and radical forms of innovation. For each community grouping, the level of co-location required varies. For the task or craft-based grouping, a high level of co-location is important to support face-to-face communication and demonstration, e.g. apprenticeships. For the professional grouping, co-location is important in the beginning to promote the development of professional status through demonstration. For the epistemic grouping, a combination of face-to-face and distanciated contact is suitable. Within the virtual grouping, technology is the predominant method used to mediate communication.

Amin and Roberts (2008) challenge the view that face-to-face or localized interactions are any different or any less effective than those formed at a distance. They argue that inter-organizational CoPs might be effective in supporting enhanced innovation outcomes for those organizations involved in both radical and incremental collaborative innovation projects. Brown and Duguid (2002) suggest the ubiquity of information makes it easy to overlook the significance of the local character of innovative knowledge and both Kivijãrvi et al. (2010) and Hasan and Crawford (2007) suggest that personal knowledge and face-to-face meetings are an essential prerequisite to the development of effective virtual communities. Hayes (2001) suggests that knowledge production in CoPs requires the capabilities to generate

'strong' perspectives within and across communities to take on board the viewpoint of others. From this perspective, learning is a process that involves becoming part of a community in which effective learning involves participation and collaboration across boundaries.

Swan et al. (2002), in a case study of a large multinational company in which radical innovation is pursued in the treatment of prostate cancer, examine CoPs across both professional and organizational boundaries (see also Mørk et al. 2006). They argue that if organizations are comprised of multiple and differentiated CoPs, then the main task becomes that of developing and maintaining a set of coherent social relations. Under these circumstances the main task of the manager is to nurture these social relations in order to promote knowledge flows across organizational boundaries. They also contend that the generally positive view of CoPs within the knowledge management literature rests largely on case studies concerned with reporting incremental forms of innovation, suggesting that more radical innovation requires the embedding of new knowledge and work practices as well as the disembedding of old ones. A number of studies have found that CoPs with a particularly strong sense of identity can create a sense of exclusion, thus inhibiting communication or collaboration (Leonard and Sensiper, 1998; Starbuck and Milliken, 1998; Baumard, 1999; Alvesson, 2000); Brown and Duguid, 2001; Hislop, 2003), and that community members may succumb to 'blinkered' thinking in the siloing of knowledge domains (Harvey et al. 2013), that ultimately excludes or sidelines new innovative ideas.

CoPs as governance structures designed for purpose

Since the initial treatment of CoPs as an *emergent* phenomenon (Lave and Wenger, 1991; Wenger, 1998) more recent publications have argued for active, rather than passive, intervention. For example, McDermott and Archibald (2010, p. 84) suggest that they can, and should be, actively managed with 'specific goals, explicit accountability, and clear executive oversight'. This view is supported by Meyer and Marion (2010), who argue that communities

that are actively managed act as ‘high-value vehicles’ for learning and knowledge sharing. A different view is that CoPs should be *cultivated* rather than managed (Wenger et al. 2002). Cultivation is said to allow CoPs to retain much of their independence whilst still receiving appropriate organizational support (Wenger et al. 2002), in contrast to the control implications of *management*, which arguably stifles creativity, sharing and initiative. Corso et al. (2008) argue that CoPs contribute to the creation of collective knowledge and that managers should respect and enable space for the situated activities that occur within communities to develop over time. In proposing seven principles for cultivating CoPs, Wenger et al. (2002) argue that cultivating CoPs by providing a strategic context and direction rather than direct management allows them to find a ‘legitimate place’ within organizations. A variety of cultivation methods have been proposed (see also Jeon et al. 2011). Cross and Prusak (2002) focus on individual actors, identifying four common role-players in the cultivation process: central connectors, boundary spanners, information brokers and peripheral specialists. By incentivizing membership, Wolf et al. (2011) suggest that organizational learning will be enhanced. Through aligning membership with the perceived benefits of participation (such as status or association with ‘successful’ CoPs), membership can enhance individuals’ social capital (Swart and Kinnie, 2007) and cross organizational boundaries (Wenger et al. 2002).

Borzillo (2009) explores the issue of autonomy versus control, noting that although some control is required in order to align CoPs with strategic goals, it would not make sense for management to exercise full control over them, as they would then no longer be independent. He explores three governance mechanisms for guiding development: (i) tight control over the quality and performance of communities; (ii) governance committees to assess CoPs activities; and (iii) ‘multiplication agents’ to promote best practice across the organization. In compiling a list of ‘ten commandments’ for governing CoPs, Probst and Borzillo (2008)

develop a model based around the role of sponsors and a leader versed in 'best practice control techniques'. However, the level of control proposed by Probst and Borzillo (2008) and Borzillo (2009) seems to equate more with *managing* CoPs than with cultivating them.

Borzillo and Kaminska-Labbe (2011) comment that the innovative capabilities of organizations can erode over time due to structural inertia. They suggest that CoPs can support organizational innovation through having sponsors and leaders exercise a moderating influence. Their research revealed two main forms of managerial involvement, which they labelled 'step-in' and 'step-out' phases. During the former, which took on average 2-4 months, managers guided activities and the communities focused their attention on specific objectives, aligning their activities with the organization's current innovation strategy. During the step-out phase, which lasted 8-10 months on average, communities were given full autonomy; this enhanced socialization levels and led to boundary-spanning activities with various other CoPs and with experts from outwith the organization. Borzillo and Kaminska-Labbe (2011) suggest that where the objective is to improve existing products (incremental innovation), managers need to 'step-in' (as sponsors) and define the topics that the CoPs are to focus on. On the other hand, if the organization wishes to develop new products (radical innovation) managers need to 'step-out' and allow members the autonomy to explore new ideas.

Those frameworks which incorporate more structure and less independence (e.g. Borzillo, 2009; Borzillo and Kaminska-Labbe, 2011; McDermott and Archibald, 2010; Probst and Borzillo, 2008) come close to conflating CoPs with formal work groups, with a manager/supervisor monitoring and leading task-based activities. Brown and Duguid (2000) argue it is about balance, although knowledge is readily accessible to members within the wider organizations of which they are a part, knowledge is often treated as a commodity in

which the organization has superior bargaining power. In this unequal relationship, CoPs do not readily surrender their knowledge. Leseure and Driouchi (2010) argue that CoPs must compete for organizational resources (such as funds, talent and entrepreneurial skills) and that managers expect a return on their 'investment'. Dahlander and Wallin (2006) argue that individuals sponsored by organizations can make a critical contribution to their innovative capabilities, creating a deeper and more diverse knowledge base. Kirkman et al. (2013) posit that 'nationality diversity' (i.e. 'the extent to which community members vary on country of origin', p.335) has an impact on innovative performance, and that higher levels of nationality diversity require greater managerial support.

Imposing a formal structure which reduces the independence of community members is likely, however, to destroy the organic, spontaneous and informal nature of CoPs (Wenger and Snyder, 2000), an essential ingredient that differentiates them from more formal groups. A lack of independence and an alignment with organizational objectives may also discourage voluntary membership and reduce the level of trust, which is often identified as another core element of communities as innovation enablers. Thus, as our typology illustrates, CoPs can act as both innovation enablers and constrainers, but the question remains: what are the central elements that can support the development of communities in leveraging innovative capabilities?

Concluding discussion: the nature and nurture of communities of innovation

We have identified four main ways in which CoPs enable and constrain innovative capability, as: (i) enablers of learning for innovation; (ii) situated platforms for professional occupations; (iii) dispersed collaborative environments; and (iv) governance structures designed for purpose. Although our four categories are not entirely discrete or exhaustive, they form a

typology from which we can develop a framework to better understand the contexts within which CoPs enable or constrain innovative capabilities (see also, Roberts, 2006). The framework we propose here (see Figure 1) is intended to act as a heuristic guide for steering organizations along a pathway that promotes effective CoPs. This framework is intended to provide insights for organizations about how they might provide practical support for constructing CoPs which enhance rather than constrain their innovative capabilities.

Intra-organizational communities can be promoted by first identifying the presence of any existing and potential CoPs and then encouraging their construction by allocating time and resources to their cultivation and sponsoring community activities. This approach supports the construction of CoPs *as enablers of learning for innovation,* and is particularly useful for organizations that wish to facilitate the internal sharing and management of knowledge, where communities serve as a mechanism for enhancing innovative capabilities. Inter-organizational communities can be promoted through encouraging employees to mobilize their personal connections and take part in collaborative activities and networking events. Such activities help overcome professionally-bounded interests, where communities are often hierarchical, protectionist and closed to outsiders, acting as power-political inhibitors that constrain rather than enable the development of innovative capabilities. These boundary-spanning activities enable the construction of CoPs *as situated platforms for professional occupations*.

In encouraging individuals to act as brokers and boundary spanners, external knowledge and expertise can be drawn into organizations for the purpose of enhancing their absorptive capacity. This supports the development of CoPs *as dispersed collaborative configurations* around close, collaborative relationships built on trust and reciprocity. These communities act as socio-contextual enablers for generating social capital and promoting collaboration and inter-organizational knowledge exchanges that enhance innovative capabilities and stimulate

innovation. Our final form - CoPs as *governance structures designed for purpose* - can be developed and fashioned through purposefully designed governance structures which draw upon appropriate forms of infrastructural support (such as tailored reward structures and the use of brokers, sponsors, and innovation champions) to stimulate collaborative activities and open up previously constrained approaches to improving innovative capability.

Our contextualized framework illustrates the ways in which collaborative activities are central to the cultivation of CoPs in building trust and reciprocity among stakeholders, ultimately enhancing social capital and improving the innovative capabilities of organizations. The latter has the potential to lead to both superior levels of incremental innovation, reinforcing and using existing knowledge to improve existing products and services, and to the transformation and generation of new knowledge required for radical innovation, resulting in new to market products and services. The challenge for practitioners lies in deciding how to apply both the typology and the framework to support the organization's innovative capabilities. For example, how do they decide which type of community is appropriate to their needs, and what mechanisms provide support for their construction? A key benefit from participating in intra-organizational communities is that this increases absorptive capacity, whereas participation in inter-organizational communities stimulates open innovation, both of which facilitate enhanced knowledge acquisition and transfer, enabling and stimulating new processes of innovation.

In order to encourage and support organizational innovation there are, then, two key imperatives: first, support the development and circulation of knowledge *within* CoPs and, second, pursue alignments *across* communities. We believe that our typology makes a significant contribution to understanding *how* CoPs can be constructed for enhanced innovative capabilities. Aligning practice may imply a critical shift in the role and orientation of certain managers towards that of *facilitator* in encouraging the construction of

collaborative communities and providing (contextualized) support as appropriate. This could be through brokering roles (Hildrum, 2007; Swan et al. 2002) and/or sponsoring and leadership roles (Borzillo, 2009; Borzillo and Kaminska-Labbe, 2011), in which the movement between cultivation and management may emerge as a central organizational competence, especially in recognizing when to provide room to maneuver and when to engage in political behaviour in steering processes of innovation and unblocking barriers to collaboration. In viewing power as a relational phenomenon, implicit in the social practices of communities and integral to practitioners' attempts to construct and facilitate the operation of these collaborative activities, our typology recognizes the need for political acumen in using a repertoire of control and cultivation techniques in engaging individuals and professional groups and in ensuring that inter-professional tensions or structural obstacles do not inhibit innovative capabilities.

Our framework for leveraging innovative capabilities provides a useful point of departure, but further development is required. Questions remain as to whether, when and how CoPs should be managed and/or cultivated, and whether such communities can be sustained over time within the power-political terrain that is endemic to organizations. Issues of power, governance and collaboration all warrant further investigation, especially within the context of an accelerating digital world where instantaneous and compressed time increasingly shape our perceptions and interactions. These can have important implications for management learning in the redefinition of relationships that may call into question traditional notions of trust and reciprocity. Further fieldwork is therefore required to study these developments through longitudinal studies that can capture these dynamic collaborative processes of learning in context and over time that can be used to further develop process-oriented theories that can accommodate the contextual, political and temporal dimensions to cultivating and sustaining CoPs. We conclude that it is this complex, contextually sensitive articulation over

time between shifting forms of support and cultivation that is central to the development of a sensitive, adaptable approach, which thereby serves to leverage the innovative potential of different types of CoPs.

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Table 1 Systematic review process

IDENTIFICATION OF INITIAL KEY WORDS	
Communities of practice	
Innovation	
Tacit knowledge	
Social capital	
Learning	
Knowledge management	
Absorptive capacity	
Open innovation	
Collaboration	
User community	
SEARCH STRINGS	
Communit* of practice AND Innovat* AND/OR Tacit Knowledge	
Communit* of practice AND Innovat* AND/OR Social Capital	
Communit* of practice AND Innovat* AND/OR Learning	
Communit* of practice AND Innovat* AND/OR Knowledge Management	
Communit* of practice AND Innovat* AND/OR Absorptive Capacity	
Communit* of practice AND Innovat* AND/OR Open Innovation	
Communit* of practice AND Innovat* AND/OR Collaboration	
Communit* of practice AND Innovat* AND/OR User Community	
INCLUSION CRITERIA	
Criteria	**Reason for inclusion**
CoPs in title/abstract	Guarantee relevance
Innovation in title/abstract	Guarantee relevance
Qualitative and quantitative empirical studies from peer-reviewed journals	Maximize empirical evidence capture
Published since 1991	Date of Lave and Wenger's original paper
All sectors	Examine sector differences in the UK
English language publications	Perceived as the universal academic language
EXCLUSION CRITERIA	
Criteria	**Reason for exclusion**
Networks of Practice	These are not CoPs
Research Consortia	These are not CoPs
Personal Networks	These are not CoPs
Community without Propinquity	These are not CoPs
Communities of Scholars	These are not CoPs
Occupational Communities	These are not CoPs
Exclusion terms used in searches	
AND NOT Network of Practice	
AND NOT Network of Practice OR Research Consortia	
AND NOT Network of Practice OR Research Consortia OR Personal Network	
AND NOT Network of Practice OR Research Consortia OR Personal Network OR Communit* without Propinquity	
AND NOT Network of Practice OR Research Consortia OR Personal Network OR Communit* without Propinquity OR Communit* of Scholars	
AND NOT Network of Practice OR Research Consortia OR Personal Network OR Communit* without Propinquity OR Communit* of Scholars OR Occupational Community	
QUALITY ASSESSMENT	
Are the research methods appropriate to the research question(s)/aims of the research?	
Is there a clear connection to an existing body of knowledge?	
Are the sample selection, data collection and analysis clear and rigorously applied?	
Is the relationship between the researcher(s) and participant(s) (where applicable) considered, and have the latter been fully informed?	
Is sufficient consideration given to how findings are derived from the data and how validity was tested?	
Has evidence for and against the researcher's interpretation been considered?	

Table 2 Papers used to build the typology

CoPs as Enablers of Learning for Innovation	CoPs as Situated Platforms for Professional Occupations
Anand, et al. (2007) Aubry, et al. (2011) Baldwin et al. (2006) Brown and Duguid, (1991) Chen and Tseng (2011) Dahlander and Frederiksen (2012) Dougherty (2001) Heiskanen et al. (2010) Jeppesen and Frederiksen (2006) Juniper and Moore (2002) Lampel and Bhalla (2007) Morrison et al. (2000) Pattinson and Preece (2014) Retna and Ng (2011) Sense and Clements (2006) Strang (2010) Terwiesch and Yi (2008)	Amidon (1998) Contu and Willmott (2003) Contu (2013) Du Plessis (2008) Ferlie et al. (2005) Garrety et al. (2004) Hamilton (2011) Harvey et al. (2013) Hotho et al. (2014) McGivern and Dopson (2010) Mørk et al. (2006) Mørk et al. (2010) Mudambi and Swift (2011) Roy and Sivakumar (2011) Tagliaventi et al. (2010) Tempest (2003) Veenswijk et al. (2010)
CoPs as Dispersed Collaborative Configurations	**CoPs as Governance Structures Designed for Purpose**
Amin and Roberts (2008) Autio et al. (2008) Bertels et al. (2011) Brown and Duguid (2001) Coakes and Smith (2007) Hasan and Crawford (2007) Hayes (2001) Hislop (2003) Hsiao et al (2006) Käser and Miles (2002) Kivijãrvi (2010) Koen et al. (2014) Lee and Williams (2007) Moon et al. (2011) Orlikowski (2002) Sakkab (2002) Scarbrough et al. (2004) Smeds and Alvesalo (2003) Snow et al. (2011) Soekijad et al. (2004) Swan et al. (2002)	Allee and Taug (2006) Borzillo (2009) Borzillo and Kaminska-Labbé (2011) Brown and Duguid (2000) Corso et al. (2008) Cross and Prusak, (2002) Dahlander and Wallin (2006) Hydle et al. (2014) Jeon et al. (2011) Kirkman et al. (2013) Lange et al. (2008) Leseure and Driouchi (2010) McDermott and Archibald (2010) Meyer and Marion (2010) Probst and Borzillo (2008) Wenger and Snyder (2000) Wolf et al. (2011)

Figure 1 Contextualized framework for constructing communities of innovation