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Quantum Phenomena in Communities of Practice

Richard Ribeiro, Chris Kimble and Paul Cairns

Abstract

Although Communities of Practice have become a core concept in understanding how knowledge is managed within organizations, there have been few studies of the praxis of formation of Communities of Practice. In this article, we report on a Grounded Theory study of the members of a previously identified Community of Practice within the UK Higher Education Academy Psychology Network. In addition to providing data on the functioning of the community, the study also revealed a hitherto unrecognized form of community that exhibits all of the characteristics of CoPs yet has only a transient existence that seems to nucleate around an existing core community. Drawing on the metaphor of quantum behaviour, we termed these communities Quantum Communities of Practice. We describe a theory to explain this phenomenon that is grounded in the data from the study. We conclude by discussing the value and validity of our findings and methodology and indicating the next steps we will take in our research.

1 Introduction

Since the publication of *Situated Learning: Legitimate Peripheral Participation* (Lave & Wenger, 1991) almost 20 years ago, Communities of Practice (CoPs) have been the focus of attention, first as a theory of learning and later as part of the growing field of Knowledge Management. A great deal of this interest has focused on the development and cultivation of CoPs, but less on how CoPs are perceived from within, both in terms of their normal functioning and on how they come into existence. This article sets out to redress the balance by presenting the results of a case study specifically designed to understand a Community of Practice (CoP) from the perspective of its participants.

One of the most striking findings of our work is the unexpected analogies between our descriptions of the way in which CoPs emerge and descriptions of the world found in quantum physics. For example, in our initial studies, we began to notice the existence of groups, later called Quantum CoPs, which bore many similarities to CoPs yet only had transient existence, repeatedly appearing and disappearing with changes in the cycle of activity. This behaviour reminded us of that of so-called virtual particles in subatomic physics where, in line with Heisenberg's uncertainty principle, particle / anti-particle pairs appear spontaneously, exist for an infinitesimally short time, and then disappear again.

The notion of CoPs emerging from participation in recurring events is implicit in much of the literature on CoPs. What is the nature of these groups and how do they relate to other descriptions of CoPs? Weick and Quinn (1999) comment that whether we see change as discrete or continuous can depend on the perspective of the observer. From a distance, a series of events may look like a set of repetitive, routine actions interspersed with occasional episodes of discontinuity. However, a closer inspection can often reveal an ongoing process of small, frequent adjustments that suggest continuous adaptation rather than sudden change.

This observation raises a methodological issue. Are Quantum CoPs simply an artefact of the method we are using, or are they a truly new form of CoP? This suggested another link to the quantum metaphor whereby, at least in the Copenhagen interpretation of Quantum physics, the instruments used to measure a phenomenon determine the nature of the phenomenon. Although we can defend against this possibility by using a rigorous and transparent methodology, this will not guarantee that Quantum CoPs are truly new and not simply an unusual representation of normal workplace activities.

The remainder of this article is structured as follows. First, we will look at the literature that deals with CoPs and Knowledge Management, focusing on the distinction between CoPs and other groups. Following this, we will examine the notion of CoPs in more detail, focusing in particular on the literature concerning the role of recurring patterns in work-based groups. This will be followed by a description of our theory of Quantum CoPs as it emerged from our data. We discuss the methodological basis for this phenomenon and argue that it is unlikely to be an idiosyncrasy of the particular method or case that was studied. Finally, we assess the relevance of our observations, outline some directions for future research and conclude that substantial further work is needed to understand the extent and influence of Quantum CoPs in a more general context.

2 When does a Community become a Community of Practice?

Before looking in detail at the notion of a Community of Practice, we will begin by looking at the links between CoPs, Information Systems and Knowledge Management and draw a distinction between the role played by CoPs and other types of group. We follow this by looking at some of the ideas concerning the role of recurring patterns in organizations, as it is often suggested that repeated interactions play a crucial role in the formation of CoPs.

2.1 Knowledge Management, Communities of Practice and Other Types of Group

The links between Knowledge Management, Information Systems and the role of CoPs and other organizational groups has been the subject of much research. In essence, the argument is that an increasing awareness of the importance of organizational knowledge has led to the development of a variety of Information Systems that attempt to manage this knowledge. However, in parallel to this, there has also been a growing recognition that most organizational knowledge remains firmly rooted in groups and individuals; consequently, to be successful, Knowledge Management initiatives are dependent on both the Information System and the behaviour of the people who work within the organization (Hildreth & Kimble, 2002; Kimble & Bourdon, 2008).

Blackler and McDonald (2000) note that compared to the 'task-continuous social structures' of the past, most modern organizations are 'task-discontinuous status structures' with a highly fragmented division of labour and diverse knowledge bases. Similarly the resource based view of the firm (Grant, 1996; Wernerfelt, 1984) also leads to a view of an organization as a collection of discrete 'human resources' that can be brought together, directed towards a task and dissolved when no longer needed. With this as his starting point, Lindkvist (2005) observes that many of the notions of a Community of Practice do not fit squarely with the way that organizations operate and suggests that dominance of the term Community of Practice has led to a neglect of other constructs such as task groups or teams.

The distinction between CoPs, teams and other forms of group has been discussed at some length in the literature. For example Wenger and Snyder (2000) provides a list of ways in which CoPs differ from teams and other forms of workplace group.

Lindkvist draws a similar distinction between CoPs, which he sees as stable and tightly-knit groups with dense reciprocal relationships and temporary project based teams that consist of individuals with little notion of reciprocity or overlapping knowledge but having a clear set of targets and a strong goal orientation (Lindkvist, 2005).

Brown and Duguid (2001) draw a distinction between the notion of Networks of Practice and Communities of Practice. Both are concerned with knowledge sharing but Networks of Practice consist of groups of people who simply share similar work related interests, are

geographically isolated and have weaker social ties. Consequently, Networks of Practice are organized at a more individual level than Communities of Practice and are based on personal rather than communal relationships (Brown & Duguid, 2001, p. 205).

	What's the purpose?	Who belongs?	What holds it together?	How long does it last?
Community of Practice	To develop members' capabilities; to build and exchange knowledge	Members who select themselves	Passion, commitment, and identification with the group's expertise	As long as there is interest in maintaining the group
Formal Work Group	To deliver a product or service	Everyone who reports to the group's manager	Job requirements and common goals	Until the next reorganization
Project Team	To accomplish a specified task	Employees assigned by senior management	The project's milestones and goals	As long as the project
Informal Network	To collect and pass on business information	Friends and business acquaintances	Mutual needs	As long as people have a reason to connect

Table 1 A Comparison of CoPs and other work groups (Wenger & Snyder, 2000)

2.2 Communities of Practice and Recurring Patterns

The term Community of Practice originated with Lave and Wenger's (1991) book "Situated Learning: Legitimate Peripheral Participation". Their objective was to explore alternative theories of learning. They were content to leave the definition of a CoP as a largely intuitive notion (Lave & Wenger, 1991, p 26). Later, Wenger developed a view of CoPs that was more closely focused on business organizations and on the needs of Knowledge Management. In essence, he argued that CoPs arise out of a need to accomplish particular tasks in an organization and provide learning avenues within that organization. In contrast to the earlier, 'intuitive' description, Wenger now offers a description of a CoP consisting of just three interrelated terms (Wenger, 1998b, p 72 - 73). A CoP can be defined in terms of:

- What it is about. The particular area of activity/body of knowledge around which it has organized itself. It is a *joint enterprise* in as much as it is understood and continually renegotiated by its members.
- How it functions. People become members of a CoP through shared practices and involvement in communal activities. This *mutual engagement* binds its members together in a single social entity.
- What it produces. The members of a CoP build up a *shared repertoire* of resources over time. Written files are an explicit example of this although less tangible examples such as rituals and idiom can also be included.

Wenger also describes a trajectory for the development of a CoP and identifies five stages that CoPs move through, each "*characterized by different levels of interaction among the members and different kinds of activities*" (Wenger, 1998a).

In his later works, Wenger focuses even more strongly on the role that CoPs can play in knowledge management. Wenger, McDermott and Snyder for example state that the focus

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of their book is "... primarily on the ability of Communities of Practice to steward knowledge inside organizations" (Wenger, McDermott, & Snyder, 2002, p 219). The notion of stages in the development of a CoP is also developed, "Like other things, communities are not born in their final state, but go through a natural cycle of birth, growth and death" (Wenger et al., 2002, p 68) The stages of development of a CoP are summarized in Figure 1 below.

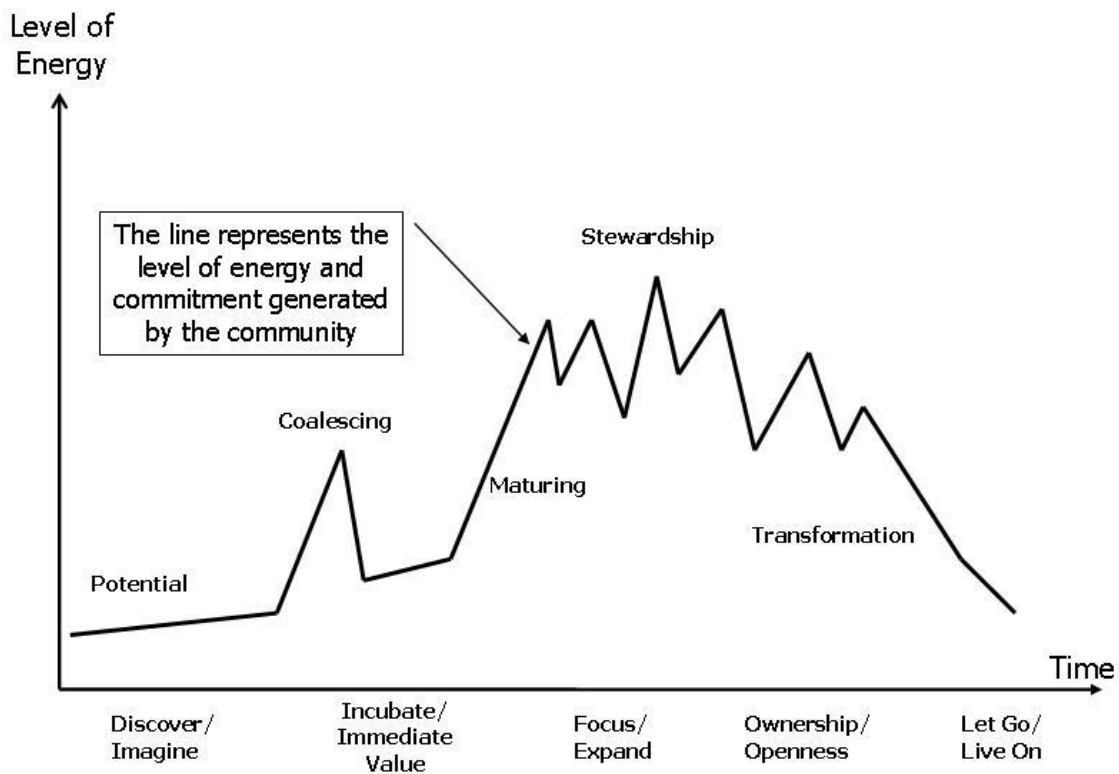


Figure 1 Stages in a communities development - adapted from (Wenger, 1998b; Wenger et al., 2002)

Although two whole chapters of the book are given over to an exploration of the ways in which CoPs develop (Wenger et al., 2002, pp 65 - 112), remarkably little is said about the ways in which CoPs actually come into existence.

The notion of CoPs emerging from repeated interactions between groups of people undertaking the same activity is implicit in much of the literature on CoPs, for example, Wenger, McDermott and Snyder, note in passing that:

"Communities of Practice arise as people address recurring sets of problems together" (Wenger et al., 2002, p 26)

However, the mechanism by which this takes place is seldom described. Cappe (2008) has produced one of the few pieces of research that specifically focuses on the early stages of a CoP. She studied the "seeds" from which CoPs grow, which she defines as follows,

"... a set Individuals who wish to interact, or who are already interacting occasionally, to share knowledge about an area of common interest in order to improve their individual or collective practices" (Cappe, 2008, p 115)

As we have discussed previously (Ribeiro & Kimble, 2008), while also stressing the role of interaction, Cappe's approach assumes that these "seeds" are groups of people who have already entered into the trajectory outlined by Wenger. In addition, her study focuses on groups that were designed, sanctioned and facilitated by the management of a particular organization: a setting that some might find questionable (Cox, 2005).

Similarly, Vaast (2004) stresses the role of repeated interaction in the emergence of CoPs, contending that CoPs are effectively situated workgroups that emerge as a result of recurrent face-to-face interactions in a materially and historically bounded context, arguing that they,

"... rely heavily on the sharing of material contexts and on situated, recurrent, direct interactions" (Vaast, 2004, p 10)

However, again, while stressing the role of repeated interaction, Vaast's description of CoPs places a heavy emphasis on the sharing of material contexts and face-to-face interaction: a description of a CoP that stands in contrast to much of the later work on the subject.

While the role of recurrent patterns of behaviour remains largely implicit in the literature on CoPs, it does feature more prominently in the wider literature. Nelson and Winter (1982) for example view organizational routines as complex patterns of predictable behaviour that act as carriers of knowledge within a firm and gradually change and evolve over time. Similarly Feldman (Feldman, 2000; Feldman & Pentland, 2003) argues that routine activities in an organization are actually generative systems that are the source of organizational growth and development.

From a different perspective, Orlikowski and Yates (2002) draw a distinction between 'clock time' and 'event time'. They argue that routine events such as weekly meetings, project deadlines and reporting periods are part of a socially constructed 'temporal structure' that is used to give a sense of rhythm and form to workplace activities. Through their repeated use, these structures are reinforced and become part of a legitimized framework that is used to regulate the life of a community.

Finally, Weick and Quinn (1999) explore the different ways in which we view the notion of recurring events. Weick and Quinn are primarily concerned with organizational change. They set out to draw a distinction between views of change that are episodic, discontinuous and intermittent and views of change that are continuous, evolving and incremental. They conclude that one of the problems of studying change is that change never really starts because it never really stops; depending on what level one views change, there is always a sense in which it can be viewed as a continuous series of minor adjustments: change, you might say, is in the eye of the beholder.

3 Case Study - The Higher Education Academy Psychology Network

3.1 Overview

The study was carried out in the Higher Education Academy Psychology Network in the UK. This is one of 24 discipline-based centres within the Higher Education Academy and the workplace of one of the authors. The Psychology Network supports the teaching of psychology across the UK. A core team, based in York, works with individuals, departments, professional bodies and overseas organizations to develop supportive networks to improve the learning experience of psychology students in UK higher education. The Psychology Network works with several communities and covers a wide range of activities. In this sense, it is similar to many other workplaces, where several projects may be running at the same

time; a mode of working that leads to time being allocated in slots and is often associated with the formation of working groups or teams.

The communities that the Network deals with have various modes of working, and communication with them can take a variety of different forms. Sometimes, Computer-Mediated Communication (CMC) is used; sometimes phone calls and sometimes face-to-face meetings. Working within the Network inevitably involves a mix of virtual and co-located communal activity. The following vignette of a typical day for "John" (a pseudonym) provides an illustration of the activities undertaken by the network.

"John finishes the meeting with the publisher and designer. It was quick as usual, as the only points that had not been discussed by exchange of e-mails were the ones that were tackled in the web conference. The Newsletter will be finished today and transferred to the server tomorrow. He calls the Network's usual printer to arrange for the submission of the file that will generate the proof. The boxes with the Newsletter should begin to arrive next week. The process will be repeated again in three months time, but for now it is time for a short meeting with the IT people to discuss some issues regarding the new website. He had already discussed the more pressing points with the rest of the staff via email, so now he only needs to check the viability of the implementation and the changes".

3.2 Methodology

The methodology used in this work is Grounded Theory (Corbin & Strauss, 2008; Strauss & Corbin, 1998). This allows the inductive formulation of a theory for a social phenomenon where there is little prior knowledge of the structure or influences underlying the phenomenon. This approach seemed an ideal way to gain a better understanding how CoPs are perceived, particularly during their initial stages where little is known about how they form.

In Grounded Theory, data is analyzed recursively to identify embedded concepts. Open coding identifies concepts, their properties and dimensions by classifying them into codes. Concepts are grouped in categories and properties related to those categories are identified. When possible, dimensions are also identified to give specificity and variation to the categories. Axial coding is then used to relate these categories with each other and to identify possible subcategories in terms of their properties and dimensions. Finally, selective coding is used to integrate and refine the categories to create a 'big picture' of the findings. The central category in our analysis, Quantum CoPs, emerged during this final step of selective coding.

The case study involved informal semi-structured interviews over a period of six months with five of the eight employees of the Psychology Network. The exceptions were the researcher, the director and one academic coordinator. The first case does not need additional explanation, the exclusion of the second and the third cases were simply due to the lack of available time.

The interviews were based on a schedule derived from Wenger's list of 14 indicators that a CoP has formed (Wenger, 1998b, pp. 125 - 26). This list has been widely used as a 'test' for CoPs and is argued by some (Murillo, 2008) to have become the de-facto definition of a CoP. In our case, we used the list to verify that the three components of a CoP, *mutual engagement*, *a joint enterprise* and *a shared repertoire*, existed. The presence of these three components was taken to indicate the existence of a CoP.

All of the questions were asked in such a way as to avoid placing Wenger's notions directly before the participants. The semi-structured interviews allowed the researcher to follow up on any interesting lines of inquiry not anticipated during the preparation of the schedule. An effort was made to allow the participant to describe events from their own perspective; this led to changes in the order of some questions as well as the inclusion or deletion of others. The approach of modifying the interview schedule in light of previous questions was driven by the process of the inductive development of theory, and is central to the Grounded Theory methodology.

4 Results - A Theory of Quantum CoPs

We knew from previous studies (Ribeiro & Kimble, 2008) that a CoP existed within the Psychology Network. The initial plan was to carry out a deeper examination and develop a theory about how it came into existence. However, during the interviews, it became apparent that its members also participated in several other groups, which only occurred during specific periods, had clear and well-defined deadlines and were usually related to ongoing projects.

For the members of the Psychology Network, the shift between the one group and another seemed natural and was hardly noticeable; it was simply a question of the allocation of time from one activity to another. Superficially, it might be assumed that these groups were simply project groups or task based teams, however, unlike team or task groups, these groups showed all of the characteristics of a CoP. Although these groups had the characteristics of CoPs, unlike the CoPs that are described in the literature they also exhibited significant periods of complete dormancy. As we indicated in the introduction, we named these groups Quantum CoPs.

A Quantum CoP can be described as a group that is:

- A CoP, in the sense that it meets Wenger's (1998b) criteria for the existence of CoP
- Constant in the sense that its members are usually the same group of people
- Active in the sense that during the periods of activity it produces an outcome
- Recurrent in the sense that it has repeated, non-regular periods of activity

The members of Quantum CoPs can be drawn from existing CoPs and/or drawn from related CoPs. However, participation in them is only invoked in response to some external stimulus; in our case this was usually a project of some description. Figure 2 below illustrates the behaviour of the Quantum CoPs that we observed in our study.

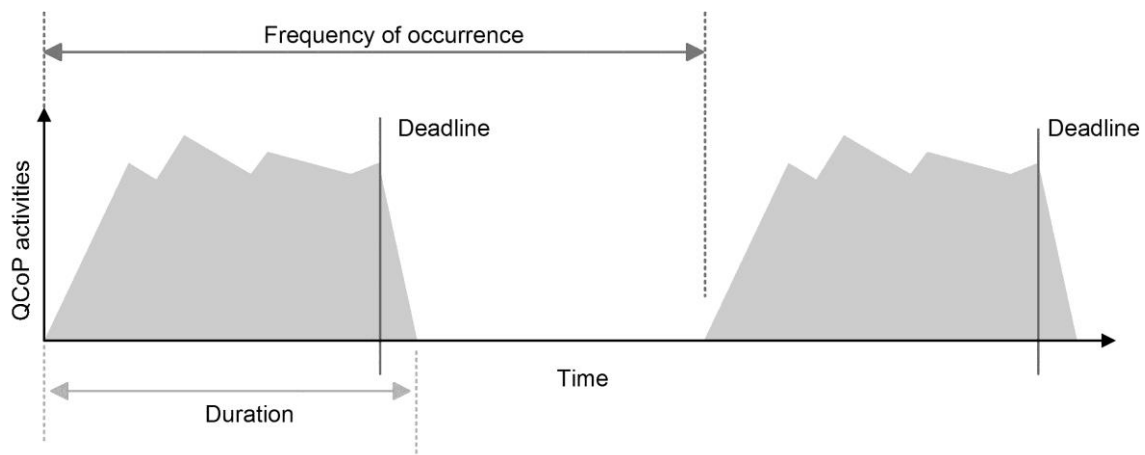


Figure 2 Behaviour of Quantum CoPs in our study

All of the interviewees provided some indication that Quantum CoPs might exist. For example,

Participant 1: "I also liaise with people in another institution as well. We've got a regional coordinator who is kind of employed by the Network but also is based in a different institution."

Participant 2: "If I'm doing SIG (e-bulletins), it's you and [H], from the Academy, and lots of other people from other universities".

Participant 3: "[...] belonging are the eight staff who work here on a contracted basis. There are a number of other people who do works for us on a regular basis. Based in varied parts of the world. It would be just hard to say the extent to which they belong to our workplace."

Participant 5: "So for example, [R] will come when she's around to do specific jobs, or she'll do editing jobs on the journal or the newsletter remotely."

Following the guidelines of Grounded Theory, several categories related to Quantum CoPs and their properties were derived, these are outlined in Table 2 and described in detail below. These constitute our theory of Quantum CoPs in the sense that they offer a set of well-substantiated statements that provide a plausible and coherent explanation for the phenomena we observed.

Categories	Subcategories	Properties
Nature of the Community		
		Internal
		External
		Mixed
Degree of Participation in the Community		
	Constancy of Participants	
	Certainty of Membership	
	Frequency of Activities	
		Regular
		Irregular
	Duration of Activities	
		Long
		Short
	Contact with Other Members	
		Constant
		Triggered
Communication Between Members		
	Face-to-Face Meetings	
	Computer-Mediated Communication	
	Environment	

Table 2 Categories, Subcategories and Properties created from Grounded Theory

4.1 The Nature of the Community

The Quantum CoPs we observed varied in composition, for example, their members could be from different places depending on the nature of the project. Sometimes they were wholly

internal, sometimes wholly external and sometimes a combination of both. Consequently, the category *Nature of the Community* has three properties: *Internal*, *External* and *Mixed*.

Participant 2: "[...] I'm taking [L]'s work, editing it, updating it then I give to [A], she then edits it, she then gives it to me. Either, we work on it and then give it to [L]. [...] Then eventually [A] is happy with it. [L] is happy with it. That's when I put it together as a document, then I come to you!"

4.2 The Degree of Participation in the Community

A second category that emerged during analysis was *The Degree of Participation* in the community. In one interview it was noted that,

Participant 3: "[...] the degree to which they are part of the community will be the degree to which they do work for us? [...] Well, that's measured by the frequency, the work or the extent of the work and so on. So, somebody is a more integral part of the community if they do more work, produce more output, have more contact with other members of the centre or with people that work in this office."

This led to the definition of a set of subcategories that proved useful in the analysis of responses from other interviews. These subcategories are described below.

4.2.1 Constancy of Participants

One of the striking features of Quantum CoPs was their membership changed very little.

Participant 2: "[In] most of the projects are the same people. Always. From the beginning to the end."

4.2.2 Certainty of Membership

Similarly, even although a Quantum CoP might be dormant, there was a strong sense of who belonged, and who did not belong, to the community. For example:

Researcher: Do you consider them [the temp workers] as members of your community?

Participant 4: "Not if they just come in and out quite quickly, no, and she wasn't even a psychology student so I think she was just earning a buck."

There is a clear sense of identity and participation in a joint enterprise. The members of the community recognize each other when they come into contact, despite the fact that others, such as temporary workers may be performing almost identical tasks.

4.2.3 Frequency of Activities

The frequency of activities is a subcategory that can help identify a Quantum CoP. If the community mostly works on a continuous basis then it may be an 'ordinary' CoP. However, if it has significant and recurrent periods of activity and inactivity, then it is more likely to be a Quantum CoP. Thus, *Frequency of Activities* can be divided into *Regular* and *Irregular*.

Participant 3: "[...] another example would be that we organize a conference every two years [...] [which] involves everybody in the running of that particular [...] conference [...] and that will be a year or more worth project where people will be involved to greater or lesser extent for the entire year."

4.2.4 Duration of Activities

Some of the triggers for an activity might only bring the members together for a short period; others might require the activity to be spread over a longer period. Thus, the subcategory *Duration of Activities* has two properties: *Long* or *Short*.

Participant 2: "[...] with the RoSP it will be, continually updating it. Continually adding more things. I suppose it is going to end, but once it is launched, then it is out there. It will forever be improved upon."

In both cases, once the trigger ceases to exist, the community becomes dormant until the next time it occurs.

4.2.5 Contact with Other Members

Finally, a Quantum CoP, like any other CoP, needs contact between its members in order for them to participate in the life of the community and share knowledge. In cases where a project is the trigger, this contact can be regular and intense; in other cases the contact can be ad-hoc and sporadic. Thus, *Contact with Other Members* has the properties *Constant* or *Triggered*.

Participant 5: "I think in day to day work [R], who also does IT work on the day to day website. We'll generally help each other out."

4.3 Communication between Members

There are a wide variety of communication media available in a typical workplace; consequently, it is not surprising that this range of choice is reflected in the way the members of our Quantum CoPs communicate within the Psychology Network. The following broad subcategories all relate to communication in the workplace.

4.3.1 Face-to-Face meetings

Almost all interviewees described the importance of face-to-face meetings where communication, and hence the exchange of ideas, is more efficient.

Participant 2: "[...] and it's only because she was here I met her. We talked about it, but we could [...] probably done it over the phone but it wouldn't have been the same. Having her here was the big thing."

4.3.2 Computer-Mediated Communication (CMC)

Notwithstanding this, Computer-Mediated Communication, usually email, was also used frequently and has become a normal channel of communication. For example, it was sometimes used as a way of queuing requests.

Participant 4: "[...] sometimes I will email her if it's something like [...] small that's just kind of [...] FYI or [...] sometimes I'll put information in her box."

4.3.3 Environment

Finally, it was noted that the open plan office had the effect of creating a feeling of closeness and ease of communication between members

Participant 2: "[...] When you are the new person, it is quite scary [...] to have to go to different doors. When you are new and everyone talks, you get to know everybody [...]."

Clearly, this characteristic can only be associated with collocated CoPs. Even although Quantum CoPs exist, albeit partially, within such an environment it is not clear at present how this can be reproduced in virtual environments. In this context, a sense of closeness is ambiguous; CMCs may only provide a sense of being able to contact somebody, Quantum CoPs however seem to operate at a fundamental level.

5 Discussion - The Discovery of Quantum CoPs

5.1 The Role of the Methodology

Our original goal was to discover more about the formation of a CoP we already knew to exist. However, after the start of the study something new began to emerge, the existence of Quantum CoPs. In one sense, these communities were the 'hidden' communities that motivated our earlier work (Ribeiro & Kimble, 2008) as they are all but invisible to their participants, in Winograd and Flores's (1986) terms they are "lost in the unfathomable depths of obviousness". Moreover, they are doubly hidden as Quantum CoPs only appear intermittently. This intermittent nature, further masked within the normal activity of a CoP, makes them particularly difficult to detect and study.

The use of Grounded Theory has been long established in sociology and more recently has been applied to the study of cultural phenomena centred around technology (Adams, Blandford, & Lunt, 2005; Cairns & Cox, 2008). The initial reason for selecting this approach was that it seemed to offer a way to get better understanding of the initial stages of the development of CoPs where little was known about how they might form; instead it seems to have revealed a hitherto unrecognized form of community, the Quantum CoP.

As far as we are aware, ours is the first study to use Grounded Theory to examine how CoPs form. It can be argued that Quantum CoPs have not been noticed previously because the methods used were not appropriate. For example, if approaches that simply gave a snapshot of working practices were used, the recurrent nature of Quantum CoPs would not be visible. Equally, it can be argued that a fine-grained method such as Grounded Theory has produced a 'false positive' indicating the existence of something that is not actually there.

5.2 Are QCoPs Real?

Grounded Theory provides a good theoretical description of the data collected in a particular study (Cairns & Cox, 2008). Whilst other researchers might find different theories in our data, we contend that the theory of Quantum CoPs is strongly supported by the data in this study.

In comparison to the groups in Table 1, it is clear that Quantum CoPs have more in common with CoPs than the other forms of group. In addition, from the data it is clear that the members of the Quantum CoPs in the Psychology Network are not driven by managerial dictat but through a desire to enhance the community to which they belong - those who teach and learn psychology.

Similarly, Quantum CoPs are not just another way to look at the recurrent behaviours exhibited by 'normal' CoPs. When active, Quantum CoPs engage in the type of recurrent interactions identified in much of the literature, however, when inactive, there seems to be no

visible interaction whatsoever between the members. Nonetheless, the structure of, and relationships within, the Quantum CoP appear to be preserved.

There is also more to Quantum CoPs than the simple collection and passing on of information that might be found in an informal network. Quantum CoPs become active because of a need to complete a specific project. Yet, in a manner that is not entirely clear, the community also manages to suspend its activities after the project finishes, and can be reanimated when the next project comes along.

5.3 Are QCoPs Relevant?

Grounded Theory per se cannot make claims for generality, but the case study itself presents good reason to suggest that this phenomenon might be found elsewhere. The Psychology Network is typical of many modern workplaces in having an open plan office with much of the work being oriented around projects. Following the standard view of the formation of CoPs this mode of working provides an opportunity for a CoP to form but also, through the necessity for individuals to take on multiple roles in the normal course of their work, might also provide the conditions for Quantum CoPs.

Possibly less usual is the requirement for the Psychology Network to involve itself in the facilitation of external communities and to co-opt people into the core organization. However, we would argue that this is not necessarily atypical. Many companies use external contractors to set up and run, sometimes the same people on several occasions. In addition, such groups often require work to be done by those external to the core group; such work is often done on a 'goodwill' basis, which again may provide the conditions for Quantum CoPs to form.

While this work is still at an early stage and based on a single organization, it does seem that Quantum CoPs are a new phenomenon that ought to have relevance in a wider context. Quite what the scope of that relevance is has yet to be determined.

6 Conclusions

We have argued that a Grounded Theory approach to a particular known CoP has produced a previously unknown variation on a CoP. Whilst much work still needs to be done to explore the full implications of Quantum CoPs, it seems that the method used holds some promise as an approach to research in this area. Viewing the study in hindsight, there were three additional potential participants that could have been interviewed, one living in Scotland, one in Australia and one in Brazil. The initial decision to exclude them was in order to focus on the collocated target community; however, these participants might now provide further insights into how Quantum CoPs function.

An interesting point arising from the study was the fluid and almost transparent use of technology. In contrast to much of the technology used to support distributed working, this was not particularly sophisticated, being no more than email, telephones and teleconferencing. The members of the community mainly used these to maintain day-to-day contact, yet when it came to crucial decisions, face-to-face meetings were still the preferred method of communication. The question then is whether communal structures such as Quantum CoPs require some form of physical collocation or if it is possible for them to exist in a wholly online environment. To attempt to answer that question, a new case study is being set up, using Social Network Analysis tools to trace Quantum CoPs in Usenet groups.

Overall, this study has suggested the existence of a rich new vein of research into what we have termed quantum phenomena in CoPs. Quantum mechanics may provide a rich

metaphor for describing and motivating this research, but clearly, there is still much to learn about these groups. It is hoped that this article will lead to further discussion, a deeper investigation and more critical analysis of Quantum CoPs.

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