Dualities, distributed communities of practice and knowledge management

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Abstract

Purpose – This main aim of this article is to explore the relationship between knowledge management (KM) and communities of practice (CoPs) in general and virtual CoPs in particular. A subsidiary aim is to provide some practical guidelines about how virtual CoPs can be facilitated and maintained.

Design/methodology/approach – The relationship between KM and CoPs is explored using theoretical constructs, the notion of a duality, and data from a case study. The article reports on a case study of a ''virtual'' CoP and highlights two key aspects of virtual working. The article demonstrates how these key aspects map on to Wenger's participation-reification duality and, in turn, on to the soft-hard duality described by Hildreth and Kimble.

Findings – The case study of a ''virtual'' CoP was based in three geographically separate locations (the UK, the USA, and Japan). The case study reports on the activities of the UK part of the CoP both at their UK base and during one of their regular trips to the USA. It highlights the importance of two particular aspects or virtual working: social relationships and the use of shared artefacts.

Practical implications – Some general conclusions are drawn from the analysis concerning the facilitation of virtual CoPs and the broader implications of dualities for KM.

Originality/value – The main contribution of the article is in making an explicit link between KM and CoPs through the use of the notion of the duality of knowledge.

Keywords Communities, Knowledge management, Social interaction

Paper type Research paper

Introduction

The benefits that communities of practice (CoPs) can bring as part of a knowledge management (KM) programme have led to them becoming the object of much attention both in academic and commercial circles. Earlier approaches to KM concentrated on the capture-codify-store approach to managing knowledge. For example, Expert Systems used ''knowledge engineers'' to try to capture and structure the knowledge of experts and code it into systems for later re-use.

However, with the recognition that not all knowledge can easily be captured, codified and stored, researchers and practitioners have begun to explore aspects of the management of what is variously called tacit, soft, implicit or less-structured knowledge. Von Krogh (1998) describes this as a shift in emphasis from a representationalist approach to knowledge, which regards knowledge as simply a representation of an underlying reality, to a constructionist approach, which regards knowledge as the outcome of a process of negotiation and social construction.

Most of the current approaches to KM are based on the division of knowledge into dichotomous opposites such as the tacit-explicit distinction popularised by Nonaka (1991). In making this distinction, Nonaka (1991) also follows a representationalist approach, as he argues that tacit knowledge can be converted into explicit knowledge if it can be articulated. However, if we accept Polanyi's (1967) arguments that there are forms of knowledge that are known but cannot be articulated because they are internalised and have become

''inaccessible to consciousness'' then this dichotomy breaks down. If this is the case, then there is clearly a need for a different approach to the challenge of managing knowledge.

In an earlier paper (Hildreth and Kimble, 2002), we argued that knowledge should not be regarded as a dichotomy, but as a duality. We argued that all knowledge has both harder and softer aspects. We regard the harder aspects of knowledge as those that can be made explicit, are structured, ''codifiable'' and can be captured and stored in knowledge repositories. The softer aspects of knowledge are those aspects that are less structured and are difficult or impossible to articulate. For example, they might be a skill, an internalised experience, internalised domain knowledge or knowledge that is embedded in the practice or social relationships of a particular group:

> Knowledge is not made up of opposites; regarding knowledge in these terms is a false dichotomy. Rather than seeing knowledge as opposites, perhaps we should think of it as consisting of two complementary facets: a duality consisting simultaneously and inextricably of both what was previously termed ''structured'' and ''less structured'' knowledge (Hildreth and Kimble, 2002).

Viewing knowledge as a duality has a number of benefits. The duality can apply to those types of knowledge that are difficult to express and capture even if they are viewed from a representationalist perspective. Most importantly, it emphasises that both sides of knowledge must be taken into account if an attempt to manage knowledge. Viewing knowledge in this way could help to explain the failure of some previous KM initiatives.

A question that is currently attracting a great deal of interest is how to share the softer aspects of knowledge. The representationalist approach simply seeks to make these softer aspects hard. CoPs have been shown to be groups where the softer aspects of knowledge can be created, nurtured and sustained (Kimble *et al.*, 2000). In the following section, we will explore CoPs to see what light they throw on the soft-hard duality.

CoPs

CoPs are groups of people bound together by a common purpose and an internal motivation. The central feature of CoPs is the relationships that develop between their members; it is here that the key to understanding the softer aspects of knowledge is to be found. Lave (1991) is credited with first introducing the term ''community of practice''. Later, the term was used by Lave and Wenger (1991, p. 98) who described a CoP as:

> [. . .] a set of relations among persons, activity and world, over time and in relation with other tangential and overlapping communities of practice.

Lave and Wenger (1991) built their concept of a CoP around the notion of an apprenticeship and illustrated their idea with separate five examples. They viewed learning that took place in these five CoPs as a form of socialisation into a community, where the newcomer gradually becomes a legitimate member of the community by learning the practice, language and conventions of the community through interaction with its established members.

Participation and reification in CoPs

Lave and Wenger (1991) focussed on an apprenticeship model of learning, however, since then, others have applied the concept of CoPs to KM in a more commercial setting.

In 1998 Wenger carried out an ethnographic study of a CoP in a claims processing unit of a large insurance company. As before, the learning that took place in the CoP was seen as a social process through which people become active participants in the practice of a community. He identified two key processes taking place in this CoP: participation and reification. In the same way as we argued that hard and soft knowledge formed a duality (Hildreth and Kimble, 2002), Wenger (1998) argued that participation and reification were similarly linked.

For Wenger (1998, pp. 55-6) participation represented:

> [. . .] the social experience of living in the world in terms of membership in social communities and active involvement in social enterprises . . . Participation . . . is not tantamount to collaboration. It

can involve all kinds of relations, conflictual as well as harmonious, intimate as well as political, competitive as well as cooperative.

However, he emphasises that participation is worthless without the other half of the duality, reification. He used the concept of reification:

> [. . .] very generally to refer to the process of giving form to our experience by producing objects that congeal this experience into ''thingness'' . . . With the term reification, I mean to cover a wide range of processes that include making, designing, representing, naming, encoding and describing as well as perceiving, interpreting, using, reusing, decoding and recasting (Wenger, 1998, pp. 58-9).

The balance between participation and reification affects the way in which meaning is negotiated in the CoP. In participation mutuality is essential, as members of a community must recognise themselves in each other. In reification however, meaning is projected on to the world and attains an independent existence.

Boundary objects in CoPs

Wenger also explains that CoPs produce shared artefacts such as tools, stories and procedures that reify something of its practice. These artefacts have knowledge embedded in them, however when knowledge is viewed as a duality, we see that only the harder aspects are reified. The reified knowledge in the artefacts is not the same as the knowledge required to use them; this may be the socially constructed, soft or participatory component of knowledge.

Star and Griesemer (1989) use the term ''boundary object'' to describe objects which are found in different intersecting social worlds but which satisfy the informational requirements of each. These objects are strong enough to retain their identity, but are flexible enough to adapt to local needs. Boundary objects address the problem of common representations in worlds that border one another. They also provide the opportunity to consider the softer aspects of knowledge as they involve interactions between different social worlds.

Wenger (1998) used Star's (1989) ideas of boundary objects to describe the role of shared artefacts in CoPs. He explained that the connections boundary objects create between CoPs are reificative. That is, they do not involve participation and are thereby able to bridge different forms of participation. They enable coordination between different communities without creating a direct link.

The different local interpretations, or interpretive flexibility, of boundary objects throws a different light on the artefacts created by a CoP. Through a boundary object, a community can gain some understanding about what is common and what is different about another community. However, the knowledge embedded in the artefact is not simply re-extracted when it is shared: additional knowledge is necessary to be able to use it. Some knowledge is embedded in the artefact, but other knowledge is ''soft'' and cannot be represented.

Virtual CoPs

Until recently, CoPs were primarily considered a feature of co-located environments. However, the pressures of globalisation and the shift towards a more distributed work force have led to an increased interest in how CoPs might function in a technologically mediated, distributed international environment.

Much of the research carried out to date has not explored virtual CoPs as such, but has been based in sociology and concentrated on communities that form on the internet (for example Fernback, 1997; Jones, 1997) or has focussed on distributed working in virtual teams (Lipnack and Stamps, 1997). The next section of this paper will report on a case study of one internationally distributed ''virtual'' CoP and will provide some empirical insights into the application of the concept of the dualities in CoPs.

WWITMan – a case study of an internationally distributed CoP

The case study explored interactions in a distributed international CoP. The CoP that provided the focus for the study was the management team of the IT support function for the

research arm of a major international organisation. The CoP spanned three geographically separate locations (the UK, the USA and Japan) and was based on a shared interest in world wide information technology (IT) management: hence the name ''WWITMan''.

WWITMan originally evolved from a multinational bidding team brought together to develop innovative bids for investment in the IT infrastructure of the organisation, but continued to evolve as the relationships within it grew. The UK core (UKIT) consists of a group manager, Wayne, and three other managers: Dave who is responsible for the infrastructure team, Stan who is responsible for the Informatics team and Mike who leads the PC support team. There is a similar core in the USA (USIT) and a single member (Chakaka) in Japan. The structure of the CoP is shown diagrammatically in Figure 1.

Interestingly, WWITMan matched the structure of distributed CoPs identified in an earlier paper (Hildreth *et al.*, 1998) where it was also observed that distributed CoPs were not completely virtual, but had co-located cores.
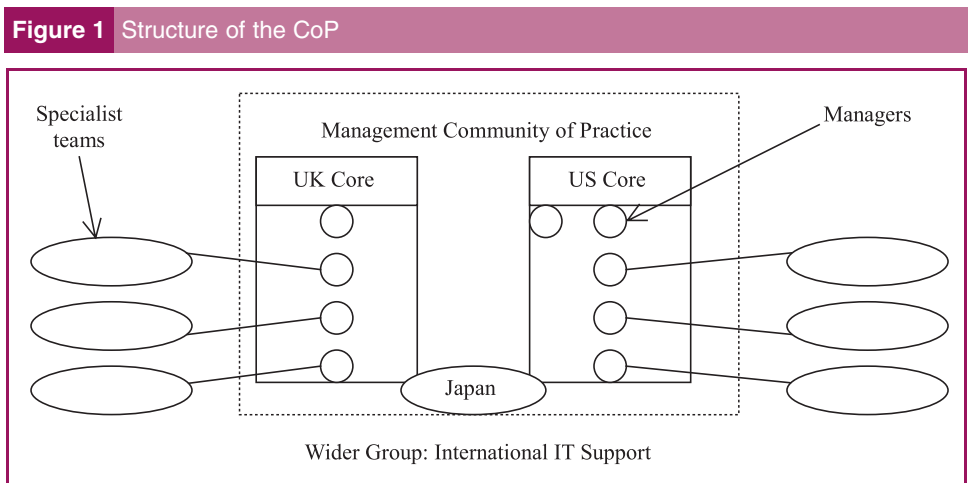
Method

The method used in the case study was an adaptation of contextual design (Beyer and Holtzblatt, 1998) and was broadly ethnographic in form. Contextual design is a method based on Grounded Theory (Glaser and Strauss, 1967) and is a multi-layered approach to the analysis of work that includes both cultural and social views of work.

The approach to data collection falls between participant and non-participant observation. The first part of the analysis stage is to create five separate work models, which are not intended to be restrictive but rather to provide support for the analysis of the data. Once a model has been created for each interviewee, the models are consolidated into a single model of each type. An affinity is created at this stage where all the insights and observations that have been recorded are organised into hierarchies to show common issues and themes.

This technique proved to be a valuable tool for gaining a deeper understanding of CoPs. In particular, the first part of the process, with its models for understanding work, proved useful for exploring the inner workings of a CoP.

Main activities in the case study

The case study was broken down into two phases. Phase 1 was spent with UKIT at their UK base. This phase was intended to provide an understanding of the work of a distributed CoP and how it functioned. Phase 2 was spent with UKIT on one of their regular trips to meet their colleagues in the USA. This phase was intended to examine the findings from Phase 1 in more depth and provide confirmation (or otherwise) of how generally they might apply. The main events of Phase 1 are summarised in Figure 2.

Figure 1 Structure of the CoP

Figure 2 The main events of Phase 1

	Case Study Timeline. Stage 1
Monday	➡ Semi-structured interview with Wayne in order to obtain the background to the CoP and set the study in context ➡ Late afternoon: Mike, Stan and DaveW have electronic meeting with 2 colleagues (Don and Linda) in Palo Alto about the development of the Knowledge Base
Tuesday	➡ Stan has a team meeting with his vertical team (Gary, Steve and DaveW). They discuss the UKIT Planning Document ➡ After the meeting Stan works on the Planning Document ➡ Stan, Dave, Mike and Wayne meet to discuss and work on the Planning Document ➡ Mike goes to an e-meeting with the overall head of WWIT (Dan) ➡ Stan works to solve a problem being encountered by one of the sub-groups of which he is a member ➡ Stan goes home and spends more time working on the planning document
Wednesday	➡ Stan, Dave, Mike and Wayne meet to continue yesterday's discussion centred round the planning document ➡ Wayne and Dave meet with one of the research groups with a view to piloting some of the research ➡ Stan joins them for the demonstration of the research ➡ Wayne and Stan meet with Bea from the Communications Department. They are meeting about the internal home page project (one of the sub-groups of which Stan is a member) ➡ Wayne makes phone calls and sorts out some e-mails tasks ➡ At home Stan continues to work on the Planning Document
Thursday	➡ Wayne, Mike, Stan and Dave have their regular weekly meeting, continuing to discuss the Planning Document in preparation for this evening's e-meeting ➡ Dave uses documents received from his team members to feed into the Planning Document and to help him plan the Y2K action ➡ In the evening Dave, Mike, Stan and Wayne have an e-meeting with their peers in Palo Alto, using the Planning Document to drive the meeting

As can be seen from Figure 2, while in the UK, the members of the UKIT spent much of their time in meetings:

■ with one another;

■ with members of other teams;

■ with members of their vertical teams; and

■ in e-meetings with members of the US core.

During this period, much of the time was spent developing a new version of an existing planning document.

The majority of Phase 2 was spent observing all the members of WWITMan in co-located meetings and observing their interactions together in both work and social settings. The main events of Phase 2 are shown in Figure 3.

The results from the case study

Although the case study yielded a number of interesting results, the two most important were:

Figure 3 The main events of Phase 2

	Case Study Timeline. Stage 2
Wednesday	→UK core arrive in California →Robert (USIT colleague) joins them for dinner
Thursday	→Mike goes in early to support an e-meeting →UKIT members have 1:1 meetings with colleagues (not all from USIT, some from other project groups) →Lunch with Robert →Two pre-arranged meetings open to all members of USIT →Evening: UKIT members go for a meal with Robert
Friday	→Mike and Wayne go in early for e-meeting →Chakaka (from Japan) present →Stan and Dave check e-mails →Business Control Audit meeting →Wayne prepares presentation →Mike has informal meeting with his opposite number and a colleague →Stan has a number of 1:1 meetings with colleagues (both in USIT and other project groups) →Wayne and Dave go to Year 2000 meeting →Dave goes to a meeting to discuss cross geography systems management →Evening: UKIT go for a meal with Robert
Saturday	→Mike has arranged to meet a friend in the city →Rest of UKIT go out for the day with Robert →Evening, UKIT (except Mike), Robert and Chakaka go out for dinner
Sunday	→UKIT take trip down the coast →Evening: barbecue at home of Doug (one of wider USIT group)
Monday	→UKIT/USIT cores go to meeting with centre directors →Meeting to prepare for off-site →Stan has a 1:1 meeting about the room booker →UKIT core give presentation to full USIT →Stan has a 1:1 with a colleague →Leave for off-site
Tuesday	→Announcement made about company structure →CoP returns early from off-site →Evening: whole CoP out together for dinner
Wednesday	→UKIT core go in early (06.45) to set up coffee talk for a UK manager →WWITMan meet to discuss the organisational restructuring →Stan has a 1:1 with Graeme (was a member of wider USIT, now a member of CoP)
Thursday	→Mike has his own meetings to attend →Stan has some impromptu meetings →There is a range of pre-arranged meetings →Dave, Wayne and Robert attend a meeting with corporate IT

1. The role of shared artefacts in the process of creating, sharing and sustaining knowledge and the role such artefacts played in facilitating participation.

2. The importance of building and sustaining personal relationships between the members, the group, and the role that face-to-face meetings played in this.

Shared artefacts

Although there were several examples of shared artefacts present in the case study, it is the use of a planning document that is of particular concern here. The document had initially been designed to assist with the planning, scheduling and co-ordination of the activities within the UK core, however, it also came to be seen as a medium for communication

between the US and UK cores, as a stimulus for discussion, as a prompt for problem-solving activities and acted as a catalyst for further collaboration.

The document as reification

At one level, the document could be seen as the reification of the knowledge of the group. As the members of WWITMan created the document, some of their knowledge became embedded in the document itself. For example, Dave worked on the section of the document dealing with the year 2000 problem; his knowledge of the issues and his expertise were reflected in that section of the document, but it was not the case that his knowledge was simply ''captured'' and could be transmitted to the others. Rather it was that the document allowed him to share the factual ''harder'' aspects of his knowledge through the document itself and provided an opportunity to share the ''softer'' aspects of this knowledge through participation and interaction with the rest of the group.

The importance of process

It is important to note at this point that it was not simply the document itself (reification), which was of value to WWITMan, but also the process of creating and using it (participation). It was Mike, when referring to an earlier version of the planning document created the previous year, who highlighted the significance of process. In the case of this earlier document, the creation of the document was seen as a goal in itself, but once the document was finished, it was seldom used. However, with the current version of the document, the process of constantly re-visiting it means the members are continually interacting and applying their knowledge and expertise to its creation. This gave the group a focus for its activities and acted as a catalyst for further discussion.

The document as a stimulus for innovation and a catalyst for participation

As indicated above, a particularly interesting aspect of the planning document was its stimulative quality. It stimulated discussion, problem solving, innovation and further participation. The planning document was used both to drive meetings and as the focus of meetings. During discussion around the document, other new and innovative ideas would often be triggered; as well as identifying projects already listed on the document, new ideas emerged that could form the basis for further participation in the community. Thus, as well as acting as a stimulus for innovation, the document acted as a catalyst leading to further participation.

The document as a medium for communication

To act as a medium for communication between the UK and the US core, the document had to cross both cultural and physical boundaries. The boundary spanning aspect of the document was the subject of both formal and informal discussion within the UK core. Knowing the members of the US core meant that the UK core could tailor their document to their intended audience. This was an example of the group using the softer aspects of their knowledge to consciously design a boundary object. The document was also used to communicate with the vertical teams in the wider organisation, thus it crossed both national and organisational boundaries.

Personal relationships

All members of WWITMan expressed a strong belief in the fundamental importance of personal relationships throughout the case study. The themes of the importance of

face-to-face meetings, the role of communication by e-media and its limitations, the role of identity and trust and the need to refresh relationships regularly were significant areas in the findings.

The role of face-to-face meetings

The members of WWITMan considered there to be a ''hierarchy'' of factors that affected the speed at which relationships could be built; at the top of this ''hierarchy'' was getting to know people through visits. The members felt that face-to-face interaction was vital for developing personal relationships. It was felt that the development of such relationships needed ''that bit extra''. The members of WWITMan could only recall two examples of relationships that had developed electronically, but both of these were the result of a (non-work-related) shared interest and were examples drawn from the wider IT team rather than WWITMan itself. The group felt that they developed relationships using face-to-face visits and then attempted to maintain them using e-media. While this worked for a while, eventually the relationship decayed to the point where they would need to meet again in order to refresh the relationship.

The role and limitations of communication by e-media

Because of the nature of the group (IT support for a major international organisation), WWITMan had considered the question of the use of e-media very carefully. Although extensive use was already made of video conferencing and other forms of electronic communication, their conclusion was that if you are going to work closely with someone, you have to meet them:

> [. . .] the big thing about actually travelling is that you actually get to meet people . . . you get to see where they live . . . and understand much more the culture they live in . . . People say that they'd like to do video-conferencing 'cause they feel they can get better in touch with you as an individual. I'd argue that they can't – it's an illusion . . . once you've built a relationship . . . then you can continue that relationship using . . . either video or audio conferencing (Mike).

Issues of identity and trust

The development of strong relationships, nearer to friendship than a simple working relationship, shows that the inner workings of a CoP are about trust. Relationships were clearly extremely important to WWITMan. Not only did they facilitate participation, but they also helped in the development of identity and the building of confidence in each other. The members of the group knew with whom they were communicating even if it was by e-mail. The trust and confidence that the members had in each other was shown by the fact that the UKIT members would trust USIT members to test some of the UK systems. Face-to-face interaction does not develop trust in itself, but it does facilitate a more rapid development of relationships, which in turn allows trust to be built.

Building an ongoing relationship

Phase 2 of the study provided several examples of how the members grew relationships with their colleagues; they expressed, explicitly, their intention of using face-to-face meetings to ''turbo-boost'' existing relationships:

> For me, personally, strengthening relationships and so on is really very important, and every time I go there, it really does help an awful lot (Mike).

They did this not only in the formal meetings, but also by taking the opportunity to have informal and opportunistic meetings and to engage in social activities such as meals and visits to each other's houses:

> [. . .] being invited back to their houses for dinner. I think that was really good . . . Every time I go across, Doug and I and Lucy will go out for meals in the evening . . . when you come back . . . you don't need any preamble. The time and distance . . . is not always relevant (Stan).

Discussion

In this section of the paper, we will discuss in greater depth how the social relationships and physical artefacts from our case study can be linked to Wenger's concepts of a participation-reification duality and to the soft-hard duality discussed earlier.

The emergence of social issues (in the form of personal relationships) and shared physical artefacts (in the form of the planning document) maps neatly on to the participation-reification duality described by Wenger (1998). As shown in Figure 4, the planning document can be seen as an example of reification in a shared artefact and the relationships between the members in the form of meetings and social activities can be seen as an example of participation. However, it is important to note that in the process of developing relationships when working online, the artefact and the process of working with the artefact underpins everything: it both reifies existing knowledge, stimulates new ideas and facilitates participation.

A point of interest was the relative proportions of the reification-participation duality. It might have been expected that in a distributed environment, sustaining participation would be more difficult and therefore reification would play a greater role. The findings of the case study showed that this was not necessarily the case. Shared artefacts such as the planning document did play an important role and played a variety of roles that the members had not previously recognised. Notwithstanding this, the importance of social relationships and face-to-face meetings remained paramount.

Participation in WWITMan was a function of the social relationships that existed between the members. It was the social relationships, built in a co-located setting, which maintained participation when the CoP became ''virtual''. These personal relationships were considered so important that the members went to the lengths of crossing the Atlantic at intervals in order to ''refresh'' them. Although relationships were important, the shared artefact also had a role to play here. It was not the artefact itself (the reification side of the duality) that was important; it was also the process of creating and working with it (the participation

Figure 4 Mapping the case study to Wenger
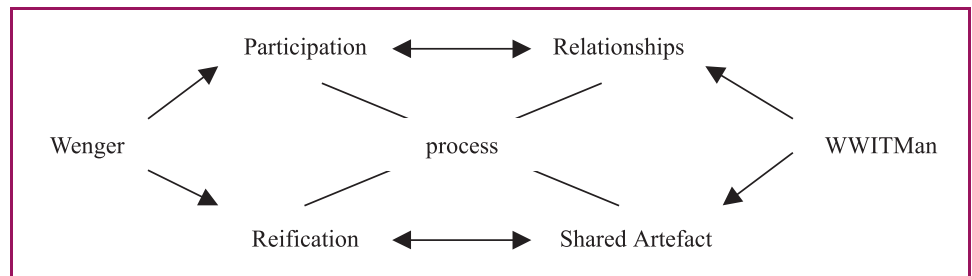
component). The ongoing development of the document was a process that allowed for continual participation in its creation.

An examination of the ways in which the planning document was used helps to shed light on the question raised earlier in the paper as to why the softer aspects of knowledge cannot simply be made hard. The ''traditional'' approach to KM would be look at the artefact itself and attempt to ''manage'' the knowledge embedded in it. However, an examination of the use of the planning document shows that it is the softer aspects of knowledge that surround the document that made it work for WWITMan. The members learn and share knowledge with each other through the process of creating it and working with it rather than from the document itself. The process of working with a shared artefact provides a link between reification and participation: it provides a focus for participation and it is through this that members are able to share and develop their knowledge.

Extending the duality

The case studies have shown that what we can see at the heart of the CoP are the use of shared artefacts and relationships built on mutuality and trust. We can add our view of the soft-hard duality to Wenger's participation-reification duality to complete the diagram first shown in Figure 4.

Figure 5 shows that the view of knowledge as a soft-hard duality that we described earlier mapped onto the participation-reification duality described by Wenger. Reification in the form of the shared artefact is not sufficient on its own - it needs the social aspects in order to share the softer knowledge. A ''traditional'' approach to KM would concentrate on externalised representations of knowledge and absolute meaning. However, as we have seen, domain and soft knowledge are necessary in order to benefit from the knowledge embedded in the artefact, be it a document, a tool or a story. The availability of the softer forms of knowledge depends on the degree of participation. Whereas if the emphasis is on reification then there will be more prominence given to hard knowledge. However, the important point for those attempting to manage knowledge is the recognition of the need to maintain an appropriate balance between the two sides of the duality.

Evaluation of the research method

The findings from the case study showed how the softer aspects of knowledge are not so much shared as (re)generated and sustained. A shared artefact such as the planning document does not serve as a vehicle for sharing soft knowledge, but it can serve as a catalyst for interaction and participation. The case study also provided some valuable insights into the way in which a virtual CoP functions. It shed light on the importance of social relationships built in a non-virtual setting to virtual working and the importance of shared artefacts in the functioning of an internationally distributed CoP. However, it must be acknowledged that there are some methodological limitations to the case study.

Figure 5 The participation-reification duality mapped to the soft-hard duality
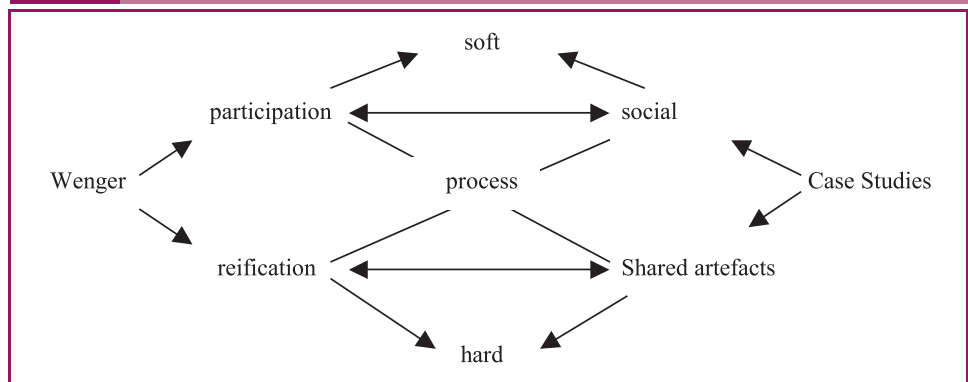
For example, the case study took place over two relatively short periods; it would have been preferable to undertake an extended longitudinal study of the CoP. It was clear that the nature of their work meant that there was no such thing as a ''representative period'' and, particularly during the Phase 2, the normal work of the USIT was interrupted by the visit of UKIT. This meant that the data had to be collected in a series of ''snapshots''. To some degree, this entailed relying on the memory and impressions of the CoP members: although an attempt was made to minimise this by using the Contextual Design technique of trying to take the respondent back in context. Creating a ''timeline model'' also helped to overcome the ''snapshot'' aspect when studying the development of the planning document.

The restrictions of the case study also meant that the apprenticeship element of the CoPs could not be fully explored. Again, this would need to be tracked over a longer period. However, the three elements of Legitimation, Participation and Peripherality, which formed the basis of Lave and Wenger's (1991) original concept of a CoP, were recognisable. It must be noted however, that apprenticeship in a CoP is not apprenticeship in the traditional, narrow sense of the word but is concerned with becoming an accepted member of the community, and this aspect could be seen clearly in the case study.

Finally, the main case study reported in this paper focussed on a CoP that was internal to a single organisation i.e. the CoP did not cross any organisational boundaries. This meant that the CoP was influenced by the same broad organisational culture. However, the fact that the organisation in question was a major international organisation meant that this was offset by the need for the CoP to cross international boundaries and to deal with differing national cultures.

Conclusions

Earlier we noted that this was a time limited case study of a single organisation, in this final section of the paper, we attempt to draw conclusions about how participation in virtual CoPs, and the maintenance of the relationships within them, might be facilitated in other organisations.

Regular and frequent interaction

Keeping in regular and frequent contact can help to maintain the relationship. However, interaction does not happen in isolation, it needs to have either a task focus or a strong motivation. The motivation to keep in frequent contact comes about a result of the development of a strong relationship. However, even when there is a high level of motivation, local issues can still hinder interaction.

Task focus and deadlines

Having a task focus can help to maintain the frequent interactions that are necessary to maintain a sense of community. Having a task focus and clear deadlines might appear to sit uncomfortably with the informal nature of a CoP, however they can help to cut through the ''noise'' of more local issues by providing a reason for interaction. A task focus can help sustain existing relationships through extended periods of e-communication.

A shared interest, desire and motivation

For a task group or team to become a CoP in the first place, the members must have the desire, motivation and will to work together. When the CoP is distributed or virtual, this is even more true. A common motivation to succeed is one of the factors that sustain the group through the periods of e-communication. It is easier to maintain participation in an electronic environment if the members are motivated to do so.

Keeping a balance

Over the period of the case study, it became clear that all three aspects: regular interaction, a task focus and shared motivation were all necessary. Each has a role to play in the maintenance and growth of the CoP and, in the right balance; the three will form a virtuous circle. As relationships develop, so the motivation and the desire interaction can become greater. As the frequency of interactions increases, the amount of participation in the practice of the community grows. As participation grows, the group begins to generate new ideas and develop new relationships, and finally the circle begins again.

> **"The important point for those attempting to manage knowledge is the recognition of the need to maintain an appropriate balance between the two sides of the duality."**

As we have argued before (Hildreth and Kimble, 2002), if the notion of a duality is accepted then all KM projects become projects that deal with both hard and soft knowledge to some degree. The importance of the social context of knowledge, and the lack of success of IT as a solution to the problems of KM, all indicate the importance of the human aspect to the management of knowledge. Rather than simply attempting to implement technological solutions, a key part of KM initiatives should be facilitating communication and interaction between people. In moving KM forward, we would argue that the right balance between the harder and the softer aspects of knowledge must be struck.

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