

***COLLECTIVE TACIT KNOWLEDGE: INTEGRATING
CATEGORIES IN THE PROCESS OF
ORGANIZATIONAL LEARNING***

Theme: The Nature of Learning and Knowledge

Swart, J

University of Bath

Pye, A

University of Bath

Contact author: Swart, Juani

School of Management

University of Bath

Claverton Down

BATH

BA2 7AY

Telephone: +44 (0)1225 38 3108

E-mail: mnsjas@management.bath.ac.uk

Abstract

This paper describes a study of tacit knowledge (TK) which began with contemporary categorizations (eg. tacit-explicit and individual-collective). However, from fieldwork, we find that TK is by nature collective (CTK) and is re-described (developed and changed) through action. These findings are depicted in our helix model of TK, which explains 'how' TK works in practice. We also distinguish four orientations to 'redescription' which act as powerful mediators of organizational learning, renewal (change) and preservation (no-change). We conclude that the distinction between categories eg. tacit, explicit, individual and collective knowledge is artificial and instead, these forms of knowledge co-exist at the collective level. Differing orientations to TK-in-action is an exciting development in appreciating organizational learning.

Introduction

The explanation of how Japanese companies create new knowledge boils down to the conversion of tacit knowledge to explicit knowledge.

Nonaka & Takeuchi (1995:11)

All knowledge falls into one of these two classes: it is either tacit or rooted in tacit knowledge. The ideal of a strictly explicit knowledge is indeed self-contradictory; deprived of their tacit coefficients, all spoken words [...] are strictly meaningless.

Polanyi (1966:195)

These two quotes represent counterpoints in the debate on the nature of knowledge and hold implications for the way in which we categorize knowledge. Importantly, these different departure points also illustrate the evolving nature of the research reported here: we began our exploration of organizational knowledge (OK) from a literature that categorizes OK into tacit and explicit and individual and collective knowledge. Following this framework we conducted an in-depth empirical study and grew to appreciate the complex and dynamic nature of knowledge. Through our research we realized that formal categories, or blocks of knowledge, do not accurately portray OK in action. Our aim in this paper is, therefore, to illustrate that the way in which we categorize knowledge has a considerable impact on the translation of OK theory into practice and indeed the advancement of theory. That is, the nature of organizational knowledge and the underlying epistemological assumptions must be a focal point if we are to advance theory about organizational knowledge.

Our developing approach not only creates an appreciation for the integrated nature of OK but also adds to the organisational learning literature by demonstrating that we can understand organizational learning from a 'knowledge in action' perspective. We illustrate from our data that different people have different orientations or preferences to knowledge in action and it is through the integration, or interaction, of these orientations that organisations can learn. The preservation-renewal framework (March, 1991) is used in this context and here we demonstrate how the integration of different orientations can either preserve or renew OK.

There has been a significant growth in OK literature during the last decade, marked by multiple constructions regarding the nature of tacit knowledge (TK) in particular. Reflecting this pattern, our literature review focuses on TK and in particular, how the relationship between TK and explicit knowledge is portrayed. Some seminal works (Nonaka, 1994, Nonaka & Takeuchi, 1995, Spender, 1996) argue that developing our understanding of OK is built upon knowing more about the conversion from tacit to explicit knowledge. Hence our approach began at this point, inspired by this conversion process, yet as we progressed, we discovered that many theorists confuse the nature of knowledge and its categorisation. In other words, some authors argue for the meaning enhancing qualities of TK yet they portray TK in action as something that can be moved along a continuum of explication. These issues are elaborated in the first section of this paper, the categorization of knowledge.

In the next section, we go on to describe how our empirical work evolved over time, as we sought to unravel some of the epistemological and ontological contra-views in literature, by demonstrating that OK is by nature tacit and collective (CTK). This is then followed by a section called TK in action in which we offer our definition of TK and outline the triple helix model which we developed from our data analysis. This is a model of the way in which participants iteratively re-present or re-describe their representations of knowledge, so changing and developing TK through action, leading to preservation (no-change) or renewal (change) of action. As we worked with our data, so we realised that there were four different patterns amongst the seventeen participants in terms of the way in which they characteristically demonstrated this redescription process in their practice. These form the focus of the next section about how the helix works in practice followed by a section called integrating orientations, which considers the implications for preservation and renewal. The final section combines discussion and conclusions as draw out some of the important implications of our model and research findings.

The categorization of knowledge

Debate about TK usually starts from the work of Polanyi (1966) who identified a form of knowledge called the tacit dimension, suggesting that "*we can know more than we can tell*" (1966: 4). His initial example of TK was about the recognition of a human face amongst a million other faces without being able to say how we go about this recognition: that is, we can tell *what we know* (recognise the face) but we cannot tell *how we know* (which process we use in the recognition). In this early example, the concept of tacit knowledge is used synonymously with that of human knowledge. It is only later that Polanyi differentiates between tacit and explicit knowledge by referring to these two forms as distinct parts in our perceptual processes (ibid., p.10).

While Polanyi's work remains central to research into TK, contemporary studies claim to build upon these epistemological assumptions yet they tend to adopt linear and dualistic assumptions in which:

- (i) Knowledge is regarded as an end product of the conversion process from data to information and finally knowledge. What is characteristic of these approaches is that knowledge is the object of a continuum that extends from interpreted information (eg. a simple pencilled diagram) to the non-representable (eg. premonitions) (Baumard, 1999:19). Hence, as Baumard (1999) points out, to

- prefer to study knowledge rather than information within the organisation entails a willingness to respect this continuum.
- (ii) Tacit knowledge is seen as separate from explicit knowledge. This assumption is often expressed through block diagrams (see Figure 1) where TK is converted into explicit knowledge or through another continuum that expresses the tacitness of knowledge. The argument here is that all knowledge starts off as individual TK and the more 'mature' the knowledge becomes, the more explicit it will be.

Davenport & Prusak (1998), for example, regard tacit and explicit knowledge as extreme poles on a continuum with the possibility of moving TK to the explicit end of the continuum; hence, tacit and explicit knowledge are regarded as being *similar in nature and function*. TK is embraced as a form of knowledge that 'has not yet been made explicit'. Others (Nonaka & Takeuchi, 1995; Nonaka, Toyama, & Konno; 2000) propose a more complex approach to TK and regard it as *something* personal that can be made public through the use of metaphors, analogies, concepts, hypotheses or models. It is assumed that individual TK is different to collective TK and in so doing, also reflects an assumption of a linear movement from tacit to explicit knowledge. Hence, the effect of moving from one ontological level to the next is seen as amplifying the value of TK: not only will TK become explicit when different pieces of individual TK are accumulated at the collective level but the concepts will also be developed and crystallised in the process of working up to the collective level (Durrance, 1998; Nonaka & Takeuchi, 1995; Nonaka, Umemoto & Sasaki, 1998).

Characteristic of such research is the notion that when individual TK is pooled at the collective level, it is *hidden* in the organization (Kogut & Zander, 1993; McAuly et al., 1997). Hence, it must be explicated via a process of externalisation which can be described as a process of concept creation (Nonaka & Takeuchi, 1995:149). Visual illustrations are offered of how it is possible to move between the tacit and explicit forms of knowledge (Baumard, 1999; Davenport & Prusak, 1998; Nonaka & Takeuchi, 1995, 1998). These are often depicted as a two-by-two matrix, portraying four boxes of knowledge - individual tacit, individual explicit, collective tacit and collective explicit - in which the creation of organizational knowledge is an integration of these. Most renowned amongst these is the seminal work of Nonaka and Takeuchi (1995) who suggest that through the phases of sharing TK, creating concepts, justifying concepts, building archetypes and cross-leveling knowledge, TK moves from individual levels to the collective level and is henceforth explicated.

In addition, these approaches characteristically link the idea of tacit skill accumulation to resource/skill based terms, thereby creating the impression of competitive advantage (Lei, Hitt & Bettis, 1996). Little explanation is provided of *how* accumulated skills (which may not even be tacit) can translate into the desired advantage. An assumption that 'it is out there' and 'it can be taught' is strengthened by this work but unfortunately without an explanation of 'what it is'.

Work in the area of individual TK often refers to "the master unable to express the skill" (Nonaka & Takeuchi, 1995), work-related practical knowledge (Wegner & Sternberg, 1986, as quoted by Brockman & Anthony, 1998, p. 205) and embodied knowledge: "what we know in our bodies in our muscles" (Durrance, 1998). Nonaka, Umemoto & Sasaki (1998, p. 148) are of the opinion that TK is physical and subjective, being created in a specific practical

context, contained by individuals in "intensive bodily experiences" (p. 59). Such knowledge can therefore be only partially shared/transferred.

However, the assumption of explication from one form of knowledge to another has been questioned on an epistemological level by Cook & Seely-Brown (1999) who argue that current work on OK is based upon an epistemology of possession and regards knowledge as *something* that individuals and groups *have*. This epistemology cannot account for knowing found in individual and group practice. The epistemology of practice or *knowing* raises questions around the notion that four distinct forms of knowledge (individual, collective, tacit and explicit) exist (Cook & Seely-Brown, 1999:381). This sub-division of knowledge makes an illusive and dynamic concept appear more manageable in theoretical terms but as we subsequently discovered, it is potentially problematic as it appears not to reflect what was *experienced* in our empirical case.

In summary, contemporary approaches regard TK as a form of knowledge that is embodied; that moves along a continuum to become explicit knowledge and that is assimilated at collective levels as a hidden resource called collective TK. Hence, knowledge is created by moving between individual and collective ontological levels (Nonaka & Takeuchi, 1995: 72-3). Consequently, these approaches, often driven by economic models of knowledge, not only regard it as critical to extract (*tap into*) TK and make it explicit but also emphasise the importance to build a knowledge stock (*pile up* the knowledge) at a collective level. Conceptually, this approach is described as the knowledge spiral (Nonaka & Takeuchi, 1995), building knowledge collateral (O'Dell & Grayson, 1998) or leveraging individual knowledge (Davenport & Prusak, 1998).

The research reported in this paper began life very much inspired by the work of Nonaka & Takeuchi (1995) and started from a position which held that: knowledge was regarded as an end product of the conversion from data to information and finally knowledge; TK would become explicit through the accumulation at the collective level of different pieces of individual TK, developed and crystallised in the process of working up to the collective level - that it is 'out there' and 'it can be taught'; and that through the phases of sharing TK, creating concepts, justifying concepts, building archetypes and cross-levelling knowledge, TK moves from individual levels to the collective level and is henceforth explicated.

The case study, methods and methodological implications

Empirical work was conducted by one of the authors in the South West Operations Management Team of the Retail Banking Division of a large retail bank, located in Bristol, UK in 1999-2000. Industry-wide issues at that time were: Internet banking; the closure of local branches; customer service provision in call centres; business processing in centralised business units; and falling interest rates which had led to falling profit margins which in turn placed more pressure on retail banking to focus on customer retention, alternative methods of service provision and efficient operations, all at reduced cost levels. This appeared to be a close to impossible task as the retail arm of the bank had extremely high cost-income ratios, where around 70% of income was taken up by costs. Furthermore, the Cruickshank Report (government-sponsored report into the UK banking industry) added to the pressure by questioning high service charges on electronic banking services.

The research participants comprised a core group of 17 senior and middle managers, and were further divided into five sub-teams. Individually, these sub-teams had responsibility for overseeing major changes in the region, e.g. one team managed the migration of processing of work from regional branches to central account management centres, set up nationally, which involved the planning and management of several thousand redundancies. These teams seemed to present ideal opportunities to observe TK in action as they were all involved in novel, complex operations (Baumard, 1999) and were faced with the challenge of 'acting in the context of the unknown'. The participants could therefore not rely on explicit guidelines as the situations that they enacted were unique.

One key characteristic, that was central to all our methods, was the intensity of the fieldwork. The author that conducted the fieldwork spent the majority of her time on site at the organisation. Through this process a high degree of trust developed between the researcher and the participants and she was included in most confidential meetings, branch closure activities and millennium planning processes. The degree of 'indwelling' (Polanyi, 1966) enabled the participants to become involved in the conceptualization of the findings and we firmly believe that it was this ethnographic characteristic of the research that led to the re-thinking of our starting assumptions and the move away from the categorization of knowledge.

This research project progressively used a variety of methods in its developing appreciation of TK. It began with competency clarification workshops, using the practitioner's language (competencies) to develop a common understanding of their practice. The aim was to see whether or not we could find evidence of TK and its use in the ways in which team members acted and appreciated their actions and those of their colleagues. To this end, 360° reviews and feedback interviews were also used as these were methods of analysis familiar to participants, provided the researcher with a valuable entrée to the research setting and was also the quid pro quo required by the company for extended research access to the team.

Building on our initial findings as well as the literature reported earlier, we then developed a scenario-based questionnaire, with participants providing a 300-word description of the scenario to which their answers would relate. Questions were open ended in order to give the participants the opportunity to give thorough explanations of their behaviour. The exploratory questions were grouped into four sections that ranged from gaining insight into how participants individually became aware of TK, how they used TK in novel situations, their enactment of TK in their teams and then whether they believed that the TK which they developed in the novel situations were integrated into existing organizational practices.

It is important to understand that through our initial findings, we had had to question some of our original assumptions at this stage. So the purpose of the questionnaire was not to see how TK is explicated but to appreciate **how TK works in action**. The results of the questionnaire were consequently integrated into what we called TK interviews which sought to clarify and develop the findings. During these interviews, participants expressed frustration with the questionnaire, saying that it was awkward to put their (integrated) behaviour into language or "to put a lifetime of experience into words". A key theme that developed during these interviews was the 'non-verbal' nature of TK. Through reflection (by both researchers and participants) on the nature of TK and the appropriateness of the methods used to explore it, our approach finally evolved to include pictorial displays. Participants felt that this was the most appropriate form of expression for their appreciation of TK.

An important implication of our fieldwork was the realization that most published accounts of research in this field seem to bear little relationship to our research experience. Indeed, rather like Kuhn (1964) observed, the image of science drawn from “the study of finished scientific achievements...from which each new scientific generation learns to practice its trade[ie. books and articles]...is no more likely to fit the enterprise that produced them than an image of a national culture drawn from a tourist brochure” (p.1). So in Kuhn-ian terms, our project might be described as the ‘rough guide’ to TK rather than the glossy holiday brochure. It was nonetheless systematic, rigorous and thoroughly evaluated at every step along the way, such that we are confident of the quality and consistency of our data and analysis. For further detail, the reader is referred to Swart (2000) for a comprehensive explanation of fieldwork and analysis.

Tacit knowledge in action

Throughout our fieldwork, we found that research participants acknowledged the importance of experience in the development of TK and offered illustration of the meaning enhancing qualities of this form of knowledge. However, paradoxically, they were unable to explicate TK. Using Polanyi’s (1964) analogy, the participants could recognise the outcome (face), they could tell us about aspects that led to the outcome (the eyes, ears, hair colour), but they were unable to describe the integration process (how all the parts of the face ‘added up to’ recognizing the face). What we are portraying here is the outcome of our exploration of TK in action (participants could tell us how TK was used), and the aspects or sub-processes that led to the outcome (participants could point to the dimensions of TK in action, for example that it was an ‘iterative process’, ‘served as a map’ and ‘made interaction possible’). This led us to conclude that TK is the **embedded patterns of interrelation that infuse action with meaning.**

These core aspects of our findings are depicted in what we call the triple helix (see Figure 2). We use the phrase and figure of the ‘helix’ because we feel it captures a continuous integration of the three strands that make up the helix. This also demonstrates a clear move away from categorizing and slicing knowledge up into tacit-explicit and individual-collective (see Figure 1). The key features of our model include:

- (i) the collective nature of TK which we label here as collective tacit knowledge (CTK) i.e. experience is at the heart of the development of TK and is by nature collective
- (ii) the co-existence of the phases of TK which brings with it an appreciation of tacit knowing, or TK in action; and
- (iii) the inexplicability of TK eg. participants were eager to point out that TK acts as a map that guides action in novel situations and felt that *"I can never tell you in a million years what this map in my mind looks like, all I know is it works."*

Some of the phrases used to explain ‘how the helix works’ have their origin in developmental psychology. The terminology of redescription draws from the work of Karmiloff-Smith (1992) who proposes that representations held of knowledge are redescribed or, more precisely, iteratively re-represented, in different representational formats to facilitate theory building: a process she calls representational redescription. We build on the concept of representational redescription to illustrate that CTK is changed and developed through action.

The three strands of the helix comprise: (i) the representations held of TK, (ii) shaping of representations through creative dialogue and (iii) practice and participation (see Figure 2). Bearing in mind the qualities of the helix discussed above, these three strands continually intertwine as TK is 'enacted' although for the purpose of theory building and explanation, we discuss each strand separately below (see Swart & Pye, 2002, for further detail).

(i) The representation of TK

This strand refers to how research participants perceived TK; that is, representations they held of embodied patterns of interrelation. Many used metaphors and spoke of a "feeling of knowing", illustrating expression of and action upon *a complex, rich picture or map of interrelations that are embedded in the organization*. At the collective level, this was expressed as a collective feeling of knowing as well as a feeling of knowing the collective.

The pictures that were built up through experience served the purpose of understanding how individual action fits into collective organizational responses. One participant described this as having a detailed map of where you live but also being aware of how this map fits into the map of the world. In a sense, TK brought into focus the relevance of local action in relation to organization-wide action. These maps also helped to differentiate between 'what manuals (or blue bibles) say and how things really work.' To use the map metaphor it guided action in a way that an experienced traveller may use a map, enabling short cuts and taking different roads when the territory is familiar.

In summary, it was through collective action and reflection that representational maps of embedded organizational responses were developed. These maps represent both patterns of interrelation and their spatial dimensions i.e. how embedded responses fit together. The representation of TK can therefore be regarded as the envisaging of a complex social system (Asch, 1949, as quoted by Weick & Roberts, 1993, p. 361): an intricate picture which takes into account a myriad of interrelations (James 1890/1950) and about which we can know more than we can tell (Polanyi, 1966). The map/representation of the social system guides collective action and gives meaning to action through its location within a particular context.

(ii) The shaping of representations through creative dialogue

This second strand describes a continuing process of reflection and questioning of assumptions which we call creative dialogue. This notion developed from the observation that participants used tools such as decision trees to illustrate issues they considered to have an impact on the organization: in effect, their understanding of effective organizational responses as guided by their representational maps of TK¹. When asked why, participants described them as, in effect, creating a platform upon which reflection on suggestions as well as possible paths of action could be built, in turn, illustrating how creative dialogue informs action.

¹ The myriad of interrelations within which their experiences are embedded was, however, not reflected in the issues raised or tools used. This confirms the Bakhtinian theory (1984, as quoted by Gergen, 1999, 130) of utterances (*decision trees* or *issues raised* in this context) which proposes that when we communicate with each other we inevitably draw from an enormous and diverse repository of past experience. The utterance carries with it not only fragments from a diverse heritage, but also significance derived from its present context and its form of intonation. Meaning in this sense could be regarded as a by-product of diverse past and present experiences.

This creative process took place in several cycles of the raising of issues and possible consequences, rethinking, resharing and again, rethinking, with strong emotional expressions of "*a light going on*" and "*it all making sense*" which leads to a belief of shared understanding. Notwithstanding this, different interpretations may remain and the process of creative dialogue is often revisited after action is taken on decisions made, creating an environment of creative conflict which led to the formulation of richer solutions.

We identify three key reasons why the dialogic dimension of the redescription process can be regarded as creative: the *diversity* of individual representations; the tensions between *action* (of dialogue and action taken upon decisions in dialogue) and *awareness of representations*; and the richness of the solutions that are generated due to the *iterative process*. This creative process is uniquely situated around fields of interest (areas of commonality), within and/or between team boundaries in the organization and between organizations in the industry as well as between industries. An important characteristic of the situated dialogue is therefore that it is *independent of organizational boundaries*, indicating that rich solutions can be generated within or between teams/organizations/industries. Similarly, team boundaries are often spanned when engaging in practice with others.

(iii) The shaping of representations through practice and participation

Practice and participation refers to the social enactment of the representations (pictures) of interrelation held between individuals. Through this third strand in the triple helix model, the tension between representation and redescription becomes evident: representation shapes action yet it is also shaped (redescribed) through its enactment. This (social) practice comprises action taken in novel, complex situations as well as envisioned future action. In other words, planning future action is regarded as a form of practice and, by mapping out action in response to novel, complex situations, personally-held representations are acted upon.

In the situations observed, their impact reached to regional level operations yet few changes were experienced organization wide. This raises some interesting questions of learning and knowledge sharing in organizations: that is, the situations studied here were chosen as they were novel, implying that much could be learnt with longer term organizational implications. However, the apparently isolated nature of each novel project meant implementation was singular and particular to that region of the organization. Renewed local practice therefore did not become organization-wide practice and ideas seemed to evaporate as soon as solutions for novel problems were generated. A striking resemblance of this 'evaporation' was illustrated in a pictorial display where the evolution of thought was presented as the metamorphosis of a butterfly in which the brightly coloured butterfly takes off and flies away, so the cycle is not completed. When questioned about this incomplete cycle, the participant explained that "*all our ideas stay with our customer, they just never become part of us*".

In summary, we found that the awareness and enactment of tacit knowledge can best be understood as a process of redescription. Within this process, 'descriptions' (representations) of TK are held in the form of 'maps of the organization', built up through interaction and experience (creative dialogue and practice and participation). A core characteristic of these descriptions (or representations) is that they are continually shaped (re-described/renewed or re-presented/preserved) through dialogue and interaction. This shaping of the maps or representations pictured is identified as the redescription of TK.

How the helix works in practice

The previous section described TK in action through the three intertwined strands of the triple helix. In practice, we observed patterns to the way different people characteristically enacted these strands, described here as four different orientations to the redescription of CTK. This was a significant development in our analysis, with important implications for our understanding of organizational learning: that is, describing preferred ways of enacting CTK in novel situations that either renewed action or preserved (March, 1991) the embedded organizational routines (Nelson & Winter, 1982).

We identified two overarching orientations, who we characterised as:

- (i) **Inquisitive thinkers:** these individuals report predominantly on their cognitive functioning, i.e. how they go about gathering information, solving problems, identifying improvements and generating options in novel situations. In other words, the emphasis is on their *cognitive patterns*.
- (ii) **Approachable socializers:** these participants focus predominantly on how they go about their interaction with others. They are sensitive to the impact of their behaviour on others and use this sensitivity to build interpersonal relationships. In other words, they prefer an interactive approach to problem-solving, highlighting *interpersonal patterns*.

As we worked through these two orientations, we found that some participants were more **strategic** in their approach than others, defining strategic as being aware of the ‘bigger picture’: how your part fits into the organization as a whole and with action implications, as well as knowing who key influencers (decision makers) are in this ‘big picture’. This analysis provided a further overlay to the cognitive and interpersonal orientations, which we labelled as **influencers**, specifically the thinking influencer and the social influencer orientations.

These strategic orientations represented an important step in the linking of individual patterns of behaviour to collective embedded patterns, i.e. the strategic whole and played a key role in the learning processes in the organisation. It was through the conceptualization of ‘workable’ responses to novel situations and the involvement of powerful players in the organisation, that behaviour patterns could be renewed, that is, ‘change’. On occasions, we noted that the strategic orientation compensated for either an extreme cognitive or interpersonal orientation and introduced ‘acceptable’ new working patterns. Table 1 offers a very useful summary of how each part of the redescription process is illustrated by in the practice of each orientation. In the sections that follow below, we first describe each orientation and then illustrate how the integration of the orientations was observed in one of the teams in the Retail Bank.

Inquisitive Thinkers

Knowledge to me is [] more than just experience. I may gain knowledge from reading or research. But someone may be experienced in an area without being knowledgeable. So yes, experience isn't the only thing that will like, build my understanding of the organisation.

Inquisitive thinkers regard the representations they hold as very personal, something that cannot be shared and a 'picture' that they are personally responsible for constructing. The iterative process of shaping thought is an internal process that circles between gathering/reading information and integrating novel understandings into the representations that they hold. For example, a participant in the Solar Eclipse project consulted several written sources on solar eclipses to gain insight into what could be expected. This insight (map held of exactly what happens during and eclipse) was then integrated into their understanding of organisational responses in order to generate possible solutions within the novel problem that they were faced with.

The redescription process takes place to a great extent in the mind of the inquisitive thinker and interaction with others in the development of renewed (ie. changed) organisational action is limited. This demonstrates that inquisitive thinkers embark upon an internal dialogue and iteration process before shaping thoughts with others through dialogue. Nonetheless, proposals of possible solutions that involved in-depth reflection were changed several times during brainstorming sessions. They regard open debate and creative dialogue as an opportunity to validate their personal ideas and solutions. A strong view is therefore held within this group that solutions are generated within oneself, yet enriched through interaction with others

When these participants gave a pictorial display of their redescription processes, they often drew a direct interaction between themselves and the problem/project. Examples of these include a light bulb next to a locked treasure chest with the participants, explaining a feeling of discovery when the novel situation is understood, or rays of sunlight shining through a brick wall with the participant drawing himself on the side of the sun. The explanation of this drawing was that '*the answers are always in you, all you need to do is explore the right ray of light.*'

The process of creative dialogue is structured for inquisitive thinkers and they seek to involve others in discussions that they consider being experts in the particular field. Importantly, when doing so, they seldom cross organisational boundaries, so the focus during creative dialogue is on integrating diverse opinions across specialist functions.

Considering the energy invested in generating possible solutions to problems and the participation in dialogue within organisational boundaries, inquisitive thinkers often find it a challenge to persuade others to accept their solutions. It is apparent that individuals who influence decisions are seldom involved during the process of creative dialogue, thereby crafting a situation where the solutions generated appear unacceptable to those who make decisions about implementation. Hence, inquisitive thinkers regard the refusal of their proposal as a symbol of the stagnation of the organisation. Furthermore, they struggle to understand why they are not appreciated for the quality solutions that they generate.

I just can't understand why my solutions are never implemented. It will save so much money and it will work. It's just [] no one can see it.

Inquisitive thinkers seemed not to have less awareness of political interrelations in their representational maps. They can, therefore, generate novel, high quality solutions but find it difficult to persuade others to believe in and act on the solutions. This observation was in contrast with the more strategically oriented, **thinking influencers** who were at the forefront of implementing novel solutions.

Thinking Influencers

'What you do is you read the situation in a way that nobody else will...and the only way to do that is to look at how something will change the pieces in your map. It's something like understanding the future.'

Contrary to the approach taken by inquisitive thinkers, thinking influencers do not delve into theoretical information to the same extent as their colleagues when they are faced with novel problems. They do however come to appreciate the complexity of novel situations by engaging in dialogue across organisational and industry boundaries, thereby embodying the tensions between representation, dialogue that shapes representations and practice in the form of interaction.

These enriched representations are constructed by interacting, through creative dialogue, with individuals and groups of individuals from diverse settings. The thinking influencers often referred to the integration of embedded patterns, which we propose above, as the ability to 'spot trends'. We argue here that the spotting of trends can be conceptualised as the juxtaposition of industry representational maps with a deep understanding of embedded patterns of interrelation within the organisation. Through this juxtaposition the thinking influencers generate several scenarios that the organisation may encounter and can therefore 'envisage' future patterns of interrelation.

This group is of the opinion that it is critical to create buy-in and for others to be involved in the solutions that needed to be implemented. In the millennium management project observed, for instance, several months were spent on visiting various branches and conducting focus groups to generate possible paths of actions within this novel situation. By engaging in creative dialogue with others that could influence the implementation of solutions the thinking influencers ensured a greater degree of acceptance for their envisaged future actions. As one participant expressed *'one needs to get into the body of the other person, understand how they will react to get their support.'*

The appreciation of the importance to embrace political interrelations in a representational map and to be guided by these representations in both creative dialogue and practice and participation was demonstrated particularly well by a striking drawing of a game of snakes and ladders, with the comment:

'You come up with the solutions but then you have to go through a process of communication and acceptance or rejection (pointing to the snakes and ladders). But you just try again until the right people buy-in to it and accept what you have come up with.'

The appreciation of the influence of key players in the organisation enables the thinking influencers to implement the solutions that are generated through their collective action processes. When these solutions were implemented, current organizational responses were challenged and altered. In other words people started to 'do things differently'. As explained in the helix, if 'the way we do things' changes, then 'the pictures we hold of the organization' changes. This is a key example of how action can redescribe representations held.

For example, during the closure of branches within the region some participants envisaged that possible future organisational responses would involve the processing of all retail transactions within account management centres that were situated nationally. The participants who held the relevant power accepted this proposal and it was therefore implemented. This involved a completely new way of approaching customer service through call centres and central processing. These new patterns of interrelation between members of the organisation became embedded and subsequently altered the representations of interrelation held by those present in the organisation.

Approachable socializers

For approachable socializers, a representational map of CTK can only be constructed through interrelation or by '*experiencing different parts of the organisation*'. They equate experience with knowledge, regardless of reflection, which means that when they take action, their principal referent is the social system within which their experience is embedded.

The notion of the value placed on experience as the primary form of knowledge is reflected in the representation of 'life experience' in the approachable socializer's map. This group commented that interrelation outside could not be separated from that within the organisation and that the social system envisaged includes a myriad of previous social experiences. As a consequence, the similarities drawn between personal and organisational life often led the approachable socializer to revert to familiar responses in novel situations.

Less attention is paid to theoretical information when approachable socializers face novel situations in which they need to take action. Written sources that provide information on issues that may need to be addressed in the context of the novel situations, e.g. articles regarding the expected influx of tourists during the period of the Solar Eclipse, are regarded as speculative. They are therefore determined to enrich their own understanding of the impact of the novel situation on the organisation whilst engaging in creative dialogue with other individuals within the organisation who they consider to be experienced.

Contrary to the approach taken by both the inquisitive thinker and the thinking influencer, this group does not construct possible future responses prior to engaging in creative dialogue. It is important to note that the approachable socializer tends to *combine* (part responses with novel situation) rather than *integrate* (try to see the situation differently) representational maps when faced with novel situations. Furthermore during the above comparison (between the novel situation and situations experienced previously) the approachable socializer likens the 'new' to the 'current' and therefore promotes the preservation of current patterns of interrelation.

In retail banking you have a fixed set of variables and any situation can effect only those.

The focus on combination rather than integration of representational maps in the redescription process often led the approachable socializer to revert to familiar patterns of behaviour in novel situations. In other words this group did engage in dialogue to generate solutions but the focus of the dialogue was on appreciating the experience of others rather than reshaping their own understanding of how to approach the novel situations. Maintaining

familiar patterns of behaviour did in some cases lead to an awareness of ‘lack of reshaping of representations held’ only after implementation of solutions.

Sometimes you become aware of the hole in your map only after you have taken action.

The heavy reliance on interaction and dialogue to generate solutions to problems enabled participants in this mode to gain acceptance for proposed future action. This does however not necessarily translate into sensitivity to the political dynamics in the organisation because in the cases observed, the solutions suggested were seldom novel and hardly ever presented a risk to the organisation or the specific individuals involved.

In summary, it can be said that the approachable socializer approached the redescription process as one of combining representations through creative dialogue to enrich their own appreciation of embedded organisational responses. Practice and participation was furthermore highly valued as the key vehicle of redescription of CTK. Historic organisational responses did however appear to be preserved by this group due to the embodiment of similarities identified between novel and familiar situations.

Social influencers

Similar to the approachable socializer, social influencers regard experience as the foundation for the construction of representations of CTK. The scope of experience referred to in this construction is far reaching and includes experience in other professional organisations. The social influencer furthermore appreciates the diversity of representations held within a group and views the collective awareness of patterns of interrelation as far more powerful than individual representations.

It is the value of the collective that motivates the social influencer to gain insight into how various maps fit together. For this group, the latter insight will provide a richer understanding of the nature of the organisation’s responses. They regard the redescription process as a combination of individual representations through dialogue and collective action. In one particular instance this process was likened to a jigsaw puzzle describing that *‘each individual holds pieces with complex designs on them yet only when all the pieces are matched, moved and finally put together will a rich, meaningful picture appear.*

The focus on experience as the foundation of representation although similar to the approachable socializer, extends further with this group to include the political sensitivity contained in the interrelations embedded in the organisation. The social influencer, therefore, networks with key players in order to build a foundation for the acceptance of solutions generated. It is also considered essential to influence the redescription processes of others during practice and participation.

Due to the mutual redescription embarked upon as well as the high regard of collective representations the social influencers believe that richer solutions are generated through creative dialogue than through consulting written information. Some information was however consulted prior to sessions where open debate was engaged in to enable participants

to develop an understanding of the impact that novel situations may have on the current embedded responses in the organisation.

Information can be valuable, it can prepare you for experience.

The social influencers accordingly integrate their appreciation of novelty into their own representational maps, in order to develop a vision of future possible responses within the organisational context. The redescription of CTK as experienced through the tension between awareness of interrelation and concurrent action is regarded as a process that ‘creates richer solutions’. Furthermore, the value of experience is embodied by interacting with colleagues at all levels of the organisation as well as with those external to the organisation. It is necessary to ‘slice through all the layers’ to embrace the richness of the redescription process. This demonstrates the value that the social influencer attached to networking and interaction, in order to gain a richer understanding of embedded organisational responses. This was evident through a particular case observed of branch closure in which the social influencer participant that led the team ensured that, throughout the implementation of migrating services to central units, the experiences were shared with those who had to embark on the process as well as people that were identified as key players.

Integrating orientations

We find that the framework of ‘preservation’ and ‘renewal’ is very useful here to advance our understanding of organizational learning (March, 1991, Crossan, et al., 1999). Some of the orientations described above played a dominant role in ‘preserving’ current working patterns whilst others could visualize clearly how ‘renewed’ (ie. changed) working patterns should look. However, sensitivity to the strategic/ political aspects of organization were the key enabler of the implementation of renewed action ie. change. We also observed that it was the integration of the various orientations that made organizational learning possible and indeed, because the helix represents collective and action dimensions, we are able to develop an approach to organizational learning that moves beyond categories (tacit-explicit) and levels (individual-collective).

Our data depict how integrating the information focus of the inquisitive thinker, with the interrelational aspect of the approachable socializer and with the holistic approaches of both the thinking influencer and the social influencer, enabled renewal our case study. It is important to understand that the outcome of this integration did not always lead to renewal, constructive learning and change. For example, in one case, a team was managed by an approachable socializer who preferred to preserve organizational responses. In another example, an inquisitive thinker had the vision of renewed responses and, despite being urged by his/her team members to create wider buy-in, saw all good intentions fail in the face of a lack of understanding from key decision-makers.

A key difference between the orientations synthesised in Table 1 is the recognition of novelty in the situations being faced, e.g. appreciating that branch closure necessitates alternative approaches to customer service. In particular, it was the inquisitive thinker, the thinking influencer and the social influencer who sought to gain insight into the nature of interrelations within these situations.

To summarise the various forms of/orientations towards reflection on representations discussed in the previous sections, these comprise:

- (i) internal reflection and iteration of thought through research and the consultation of theoretical sources (for the inquisitive thinker and the thinking influencer)
- (ii) creative dialogue to generate both alternative paths of action as well as awareness of current paths of action (for the thinking influencer and the social influencer)
- (iii) linking practice to creative dialogue through the sharing of experience (for the social influencer)

We do acknowledge that representations or maps can guide action without necessarily implicating awareness of these maps. However, when creative dialogue and the iteration of envisaged paths of action are included then we regard this as an important indicator that the person is aware of the maps that guide their action. Awareness in this context makes a significant distinction between learning that ‘takes place reactively’ and ‘planned’ renewal of working patterns.

This awareness of the ‘maps that guide action’ that enabled planned renewal confirms what Watzlawick, Weakland and Fisch (1974) identified as second-order change or the change of the way of understanding action. Planned renewal could therefore result in the change of patterns of behaviour that comprise a social system. We argue here that our study was focused on planned renewal or preservation where individuals sought information (inquisitive thinkers) or engaged in dialogue (approachable socializer) to *actively plan* a future path of action in the novel situation that they were faced with.

Central to planned renewal of action is the awareness of political interrelations in the representations held. In other words, if future solutions are developed and suggested but the key players in the organisation are not supportive of these plans, then the likelihood of their implementation, and ultimate renewed paths of action, is limited. As depicted in the previous section, it is characteristic of both thinking and social influencers to involve key players in creative dialogue and take into account the political interrelations embedded in the organisation. The inquisitive thinker, however, often generates viable future paths of action after several cycles of reflection and redescription and with less success of acceptance and implementation in the organisation.

It is therefore proposed that the planned renewal may be facilitated by

- (i) the awareness of the redescription of CTK
- (ii) the envisaged future possible paths of action, and
- (iii) the awareness of political interrelations in the representations held

From the above it should not be assumed that awareness of redescription will always lead to planned renewal: indeed, it is precisely due to this awareness that preservation may be sought. A further distinction needs to be drawn here between planned preservation and preservation of working patterns due to being unaware of redescription. It is possible that collective action can continue to remain unchanged because those acting in a social system are unaware of representations that guide their action or even of systemic changes that redescribe their representations.

We propose that paths of action, or organizational routines, can be in flux and be renewed or preserved without awareness of the representations that guide and shape the action. Planned

renewal or preservation is, however, intimately linked to the awareness of redescription and envisaged paths of action. Planned renewal is more likely to be embedded in the organisation if the awareness of the representations held embraces political sensitivity.

In summary, we have identified four different orientations to the re-description process, depicting characteristic ways in which participants went about solving problems in novel situations: inquisitive thinkers demonstrated a preference for written material and expert sources of information, thereby generating new and alternative approaches to a novel situation; approachable socializers favour an interpersonal approach to 'doing more of the same' in similar situations. These two orientations then led us to highlight a further group of participants in our analysis: the influencers. Both thinking influencers and socializing influencers involve key decision-makers in the implementation of their novel solutions due to the inclusion of political sensitivity in their representational maps; for the former, the emphasis is principally cognitive and for the latter, it is more social.

Identifying different orientations is an important contribution to developing our understanding of TK, showing how collective tacit knowledge is redescriptioned in different ways through collective action. More importantly though, is the process whereby the various orientations are integrated: the four orientations combine or 'grate against one another' to change (renew) or maintain (preserve) organizational responses.

Discussion and Conclusions

A contemporary and certainly dominant approach to the nature and categorization of organisational knowledge is its division into tacit and explicit and individual and collective knowledge (Nonaka, 1994; Baumard, 1999; Spender, 1996). Indeed the work reported here started from this taxonomy, however, when translated into practice the authors found conflicting epistemological assumptions that underpin clear boundaries between tacit-explicit and individual-collective forms of knowledge. Some of our key findings were that participants claimed awareness of TK, as theoretically abstracted/ recognized, yet in practice, regarded this form of knowledge as 'pictures of experience' that are built up over a period of time. Importantly, these pictures appeared to serve as guides to action and created meaning when faced with novel situations but were never verbalised.

These findings lead us to re-view our approach to knowledge categories and indeed the nature of knowledge. Here we conclude that as Polanyi (1966: 195) stated '*all knowledge is either tacit or rooted in tacit knowledge*'. The view that TK cannot be made explicit stands in contrast to that of Nonaka and Takeuchi (1995) and is supported by Polanyi's (1966) argument which states that objects are meaningless without appreciation of the TK in which they are rooted: that is, action that has permanence has little meaning if not understood from its embedded interrelations. In Polanyi's terms (1964), one can argue that it is in attending *to* the collective action *from* that appreciation of the interrelations in which it is rooted that the action becomes meaningful. Furthermore, he argues, the focus and intention to explicate TK can destroy the meaning of the interrelation.

We can identify then two alternative structures [] so as long as you look at X, you are not attending from X to something else, which could be its meaning. In order to attend from X to its meaning, you must cease to look at X, and the moment you cease to look at X you cease to see its meaning.

Polanyi (1964:146)

If the action that we understand and may want to change in the social world is completely embraced by its meaning infusing structures of TK, then on this basis, it seems inappropriate to portray knowledge processes in organizations as blocks of TK being transferred to explicit knowledge. Our data further evidenced that the 'loop' between tacit and explicit knowledge may be impossible because of the qualitative differences between tacit and explicit knowledge. This finding resonates with James's (1890/1950: 254-255) model of awareness as consisting of a nucleus and a fringe².

Hence, we present our triple helix model as an alternative to contemporary approaches (see Figures 2 and 3) based on social constructionist epistemological assumptions: ie. that meaning is not a given or external to the individual but constructed through discourse and the patterns of interrelations between individuals. Figure 3 is an illustration of the destination of our research journey: it highlights that knowledge cannot be 'divided into' tacit and explicit knowledge. More importantly we cannot assume the transition from one form of knowledge to another, especially if these categories coexist to inform action. Finally, collective learning, framed here according to the renewal and preservation of organizational responses, cannot be depicted at different levels. In other words we cannot move from individual to group to organizational learning. We develop an approach that emphasises learning through action at the collective level.

On this basis, TK is defined as the embedded patterns of interrelation that infuse action with meaning. We, therefore, propose that TK constructs the social reality of organization as it is simultaneously constructed by those who share the social reality through action. Berger & Luckmann (1966, p. 84) argue that knowledge about society is thus realisation in the double sense of the word: in the sense of apprehending the objectivated social reality, and in the sense of ongoingly producing the reality. In other words, by engaging in action in a social space one apprehends the embedded patterns and is both guided by and constructs these patterns.

Parallels can be drawn here between the interrelation approaches to TK and the description of Schutz's (1962) primary knowledge:

The primary knowledge about the institutional order is knowledge on the pre-theoretical level. It is the sum total of 'what everybody knows' about the social world, an assemblage of maxims, morals, proverbial nuggets of wisdom, values, beliefs, myths and so forth.

(As quoted by Berger & Luckmann, 1966, p. 83)

² According to James, the nucleus and the fringe of awareness present qualitatively different kinds of information. The fringe represents the context and the web of relations that *give meaning* to the particularised contents of the nucleus. For James, meaning is not intrinsic to a thing but is given by the network of other knowledge and relations in which it is embedded. Furthermore according to James' model, the context of the 'fringe' cannot be brought into the nucleus. James (1890/1950) illustrated his fringe/nucleus idea through the analogy of a river flowing over pebbles serves to demonstrate the stance taken here: the river presents that which gives meaning to experience (tacit knowledge) and the pebbles represent that which is concrete (explicit knowledge). If an attempt is made to transform the flowing of meaning into concrete pebbles, then the river which gives life to the pebbles, in essence, will disappear. Hence, attempts to convert tacit knowledge into explicit knowledge may destroy the meaning of the experience.

It is the sum total of what everybody knows about the world of the organization as well as the world in which it is embedded that cannot be explicated but provides meaning to interaction. The specific qualities of this knowledge are that of *historicity*, *control* and *shared meaning*. In other words, embedded patterns of interrelation are preserved through generations in the organization and therefore inform action. The latter is only possible if the representation of these patterns is shared in a social space and, in so doing, enables collective action. It is the sharing of the patterns of interaction which allow for the meaning-infusing characteristic of TK. For this reason, we cannot concur with Leonard and Sensiper (1998) that "sharing tacit knowledge requires time devoted to personal contact" but instead, would propose to rephrase this to say 'sharing (and learning) the embedded patterns of interrelation that infuse action with meaning requires time devoted to personal contact'.

A further conclusion developed from this perspective is that the distinction found between collective and individual TK in many present-day works on TK is somewhat artificial (Baumard, 1999; Nonaka & Takeuchi, 1995; Nonaka, Toyama & Konno, 2000; Spender, 1996). Our research shows that the social construction of knowledge and, in particular, knowledge that infuses meaning, does not 'move from a collective level to an individual level': it is collective by its very nature. In summary, we argue here that TK is a form of knowledge that gives meaning to our experiences, actions and future behaviours. The essence of its social nature has been expressed, hence the distinction between individual and collective TK is artificial.

Another key contribution of the paper is the recognition that our participants held different orientations toward TK-in-action or the redescription process, i.e. that people enact the helix model in various ways. These different orientations include:

- (i) **Inquisitive Thinkers** who focus more clearly on the cognitive aspect of their representations, i.e. how information is used, which information is important and which expert can supply the information. This may lead to the development of novel responses to a problem, however, the lack of strategic awareness and representation of political patterns in the organization may lead to the lack of acceptance of the 'brilliant new plan.'
- (ii) **Approachable Socializers**, who pay more attention to creative dialogue and conversational access to solutions. Current representations are seldom challenged and there is a strong tendency to recreate previous solutions. These solutions may also be more popular amongst team members because this group involves several colleagues in the development of solutions.
- (iii) **Thinking Influencers** who enacted a similar redescription process as their inquisitive thinker counterparts; however, they held vivid representations of political patterns in the organizations. This enabled them to gain support from key decision-makers and often their radical responses were accepted and implemented. In our research this led to renewed organizational responses within the particular part of the organization that we were studying
- (iv) **Social Influencers** held pictures of how the organization functioned on an interpersonal level and were aware of possible ways to influence stakeholders to get decisions implemented. They also networked widely when engaging in dialogue and through this process, revisited the 'pictures' that they held of how the organization can respond in novel ways, often to greatest success in organizational renewal.

The interaction between these different orientations to TK-in-action enabled us to develop an alternative approach to organizational learning in which individual and collective learning is integrated through the 'collective representation of organizational responses'. Within this context, the preservation and renewal of the organization's responses takes place through collective redescription or the combination of all four of our identified orientations. Indeed, this action-orientated approach to organizational learning develops an appreciation of the integration of the categories of knowledge as well as the levels of learning. Hence, we see organizational learning as a process that is facilitated through the integration of various orientations toward redescription.

This approach offers the opportunity for further exploration of the redescription processes in different industries, given that the embedded patterns of behaviour may differ from industry to industry. Future research may also include extended work on the links between modes of orientation to TK in action and organisational learning models. Finally, we suggest that our approach to organisational learning, which questions the traditional divisions between the individual, team and organisational levels of learning, can be used to develop existing theory on the processes of organisational renewal/ change.

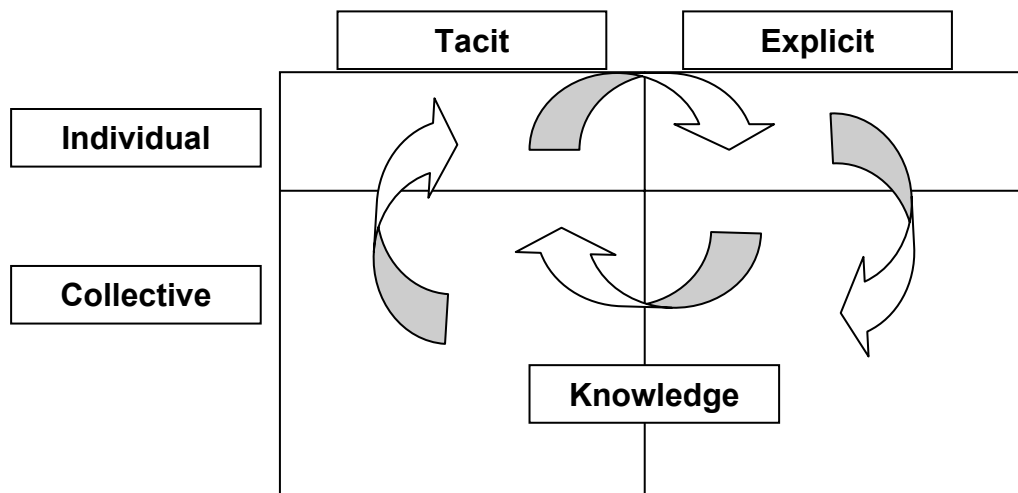
References:

- Baumard, P. (1999) *Tacit knowledge in organisations*. London: Sage.
- Berger, P., & Luckmann, T. (1966) *The social construction of reality*. London: Allen Lane.
- Brockman, E.N., & Anthony, W.P. (1998) The influence of tacit knowledge and collective mind on strategic planning. *Journal of Managerial Issues*, 10 (2): 204-223.
- Cook, S.D.N., & Seely Brown, J. (1999) Bridging epistemologies: the generative dance between organisational knowledge and organisational knowing. *Organization Science*, 10(4): 381-400.
- Davenport, T.H., & Prusak. L. (1998) *Working knowledge: how organizations manage what they know*. Harvard Business School Press, Boston, Massachusetts.
- Durrance, B. (1998) Some explicit thoughts on tacit learning. *Training & Development*, 52 (12): 24-30.
- James, W. (1890/1950) *The Principles of Psychology (vol. 1.)* London: MacMillan & Co.
- Karmiloff-Smith, A. (1992) *Beyond modularity. Developmental perspective on cognitive science*. London: MIT Press.
- Kogut, B., & Zander, U. (1993) Knowledge of the firm and the evolutionary theory of the multinational corporation. *Journal of Business Studies*, 24 (4): 625-676.
- Kuhn, T. (1964) *Scientific Revolutions*, Chicago: University of Chicago Press.
- Leonard, D., & Sensiper, S. (1998) The role of tacit knowledge in group innovation. *California Management Review*, 40 (3), 112-132.
- Lei, D., Hitt, M.A., & Bettis, R. (1996) Dynamic core competences through meta-learning and strategic context. *Journal of Management*, 22 (4): 549-569.
- March, J.G. (1991) Exploration and exploitation in organization learning. *Organization Science*. 2: 71-87.
- McAulay, L., Russell, G., & Sims, J. (1997) Tacit knowledge for competitive advantage. *Management Accounting (British)*, 75(11), 36-38.
- Nelson, R., & Winter, S.G. (1982) *An evolutionary theory of economic change*. Cambridge, Mass: Harvard University Press.
- Nonaka, I. (1994) A dynamic theory of organizational knowledge creation. *Organization Science*. 5(1): 14-35.
- Nonaka, I., Toyama, R. & Konno N. (2000) SECI, Ba and leadership: a unified model of dynamic knowledge creation, *Long Range Planning*, 33(1): 5-34
- Nonaka, I., Umemoto, K., & Sasaki, K. (1998) Three tales of knowledge creating companies. In G. van Krogh, J. Roos and D. Kleine (eds.), *Knowing in firms*. London: Sage.
- Nonaka, I., & Takeuchi, H. (1995) *The knowledge creating company*. NY: Oxford University Press.
- Polanyi, M. (1966) *The tacit dimension*. Routledge and Kegan Paul, London.
- Polanyi, M. (1964) The logic of tacit inference. In M. Grene (ed.), *Knowing and Being, essays by Michael Polanyi* (1969). London: Routledge and Kegan Paul.
- Spender, J.-C. (1996) Organizational knowledge, learning and memory: three concepts in search of a theory. *Journal of Organizational Change Management*. 9 (1): 63-78.
- Swart, J. (2000) Collective tacit knowledge and self-awareness: an exploratory study. Unpublished doctorate: University of Bath
- Swart, J., & Pye, A (2002) Conceptualising organizational knowledge as collective tacit knowledge: a model of redescription. 3rd European conference on organizational knowledge, learning and capabilities, Athens, 5-6 April.

- Watzlawick, P., Weakland, J., & Fisch.R. (1974) *Change, principles of problem formation and problem resolution*. NY: W.W. Norton.
- Weick. K.E., & Roberts, K.H. (1993) Collective mind in organizations: heedful interrelating on flight decks. *Administrative Science Quarterly*, 38: 357-381.

Figure 1 Knowledge categories in contemporary discourse

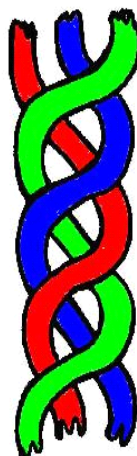
(Baumard, 1999, Cook & Seely-Brown, 1999, Nonaka & Takeuchi, 1995, Spender, 1996)



- Basic assumptions:
- Knowledge is justified true belief
 - Tacit knowledge exists separately from explicit knowledge
 - Tacit knowledge can be explicated
 - The explication can be accumulated at the collective level.

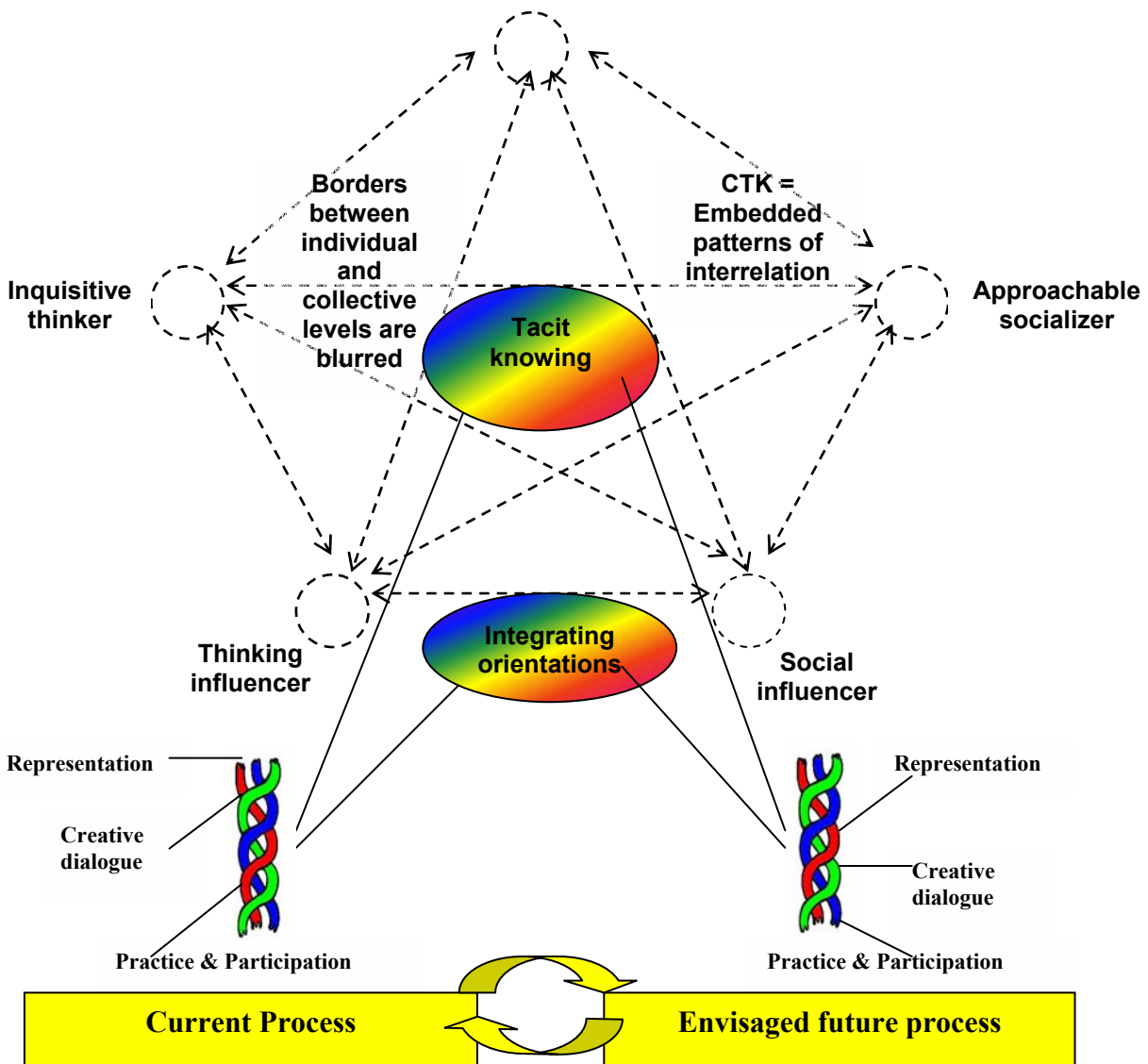
Figure 2 The Triple helix: integrating categorizes

The threads of the redescription process co-exist: participants weave together these threads at any particular moment in time in order to 'redescribe' TK.



- **Representation**
of embedded patterns of interrelation
- **Creative dialogue**
reflection on and questioning of assumptions held, personal or collective
- **Practice and participation**
Collective action, or the enactment of dialogue

Figure 3 Depiction of CTK as informed by our research: integrating categories in the process of learning



Basic Assumptions

- Knowledge is socially constructed
- CTK comprises embedded patterns of interrelation (with implications of historicity)
- Tacit knowledge cannot be explicated and explicit knowledge is embedded in CTK
- Continuous tensions exist between the awareness of CTK and collective action
- Tacit knowing comprises the reciprocal tension between the representations held of embedded patterns of interrelation, creative dialogue and practice and participation.

Table 1 Summary integration of the redescription processes and the four orientations

Redescription process	INQUISITIVE THINKERS	THINKING INFLUENCERS	APPROACHABLE SOCIALIZERS	SOCIAL INFLUENCER
Representation	Experience is valued only with reflection. Regards the representation of CTK as more than experience	Values both experience and explicit information as the foundations of representation.	Experience as the foundation –builds maps only through direct experience Includes general life experience	Experience as the foundation- the scope of experience is far reaching and includes inter-organisational involvement.
	Values theoretical information and consults several written sources prior to engaging in creative dialogue with others		Theoretical information regarded as speculative	Explicit information is regarded as preparatory for experience
	Builds representational map of novel situations through theoretical sources and enmeshes this appreciation with own representation to generate possible future paths of action	Builds representational map of novel situations through theoretical sources and enmeshes this appreciation with own representation to generate possible future paths of action		
	Embarks on several internal iterations of thought before sharing framework with others		Fixed set of variables envisaged with limited changes in representations held.	Values collective redescription ,e.g. Jigsaw puzzle
	Limited political sensitivity in representations held	Includes political sensitivity in representation of embedded interrelations	Includes political sensitivity in representation of embedded interrelations	Includes political sensitivity in representation of embedded interrelations

Creative dialogue	Dialogue within boundaries of team, or specialist field	Crosses several boundaries internal and external to the organisation	Is regarded as the key to understanding the impact of novel situations on the organisation	Crosses several boundaries internal and external to the organisation
	Internal process before engaging with others	Enmesh maps of novelty with current representations to envisage future action.	Combines rather than integrates maps	Enmesh maps of novelty with current representations to envisage future action.
	Structured and targeted process – mainly with subject experts.	Uses dialogue as an instrument of influence	Guided by spatial representations ³	Uses dialogue as an instrument of influence
Practice and participation	Generates alternative solutions with less success in creating buy-in	Networks with key players – creates buy-in for alternative solutions	Successful at implementation of familiar solutions	Networks with key players – creates buy-in for alternative solutions
	Continuous reflection on action and subsequent redescription –individual	Continuous reflection on action and subsequent redescription – individual	Creates awareness of ‘holes’ in the representational map - individual	Links practice back to creative dialogue by sharing experiences and embedding - collective
	New forms action not embedded into current patterns of interrelation	Embeds new forms of action into current patterns of interrelation ⁴	Repeats previous forms of practice	Embeds new forms of action into current patterns of interrelation ⁵
	PRESERVATION	RENEWAL	PRESERVATION	RENEWAL

³ Knowing the spatial element of effected areas in the organisation as well as individuals that hold representations of those areas.

⁴ Only observed in local regions of the large organisation.

⁵ Only observed in local regions of the large organisation.

