

Chapter 3 Knowledge is Skilled Performance

This chapter applies ideas from chapter two about knowledge and practice, by investigating expertise and knowledge as embodied human expertise. It discusses various case studies and corporeality in human sense-making. It investigates how knowledge is embodied in how we perform when we communicate, exchange ideas, present information to each other, train and learn, become skilled. How we relate with others is a skilled performance.

Introduction

In this chapter we consider four ideas in the investigation of tacit knowing as a personal act of knowing: a) I know what I know and can talk about it because I have become skilled in performing it. (i.e. It's not in my head); b) with my imagination, I build a picture of the knowledge; c) the identification of a problem that needs to be solved is not necessarily done by the 'expert' but by a mediator of the problem, however, only the expert can recognise the mediator and solve the problem; d) I realise my knowing in my co-performance with you: knowledge cannot live outside dialogue, and dialogue is skilled performance, and since knowledge is carried in dialogue, knowledge is skilled performance. The discussion critiques the dominant model of expertise that has as its premise the concept of the autonomous expert. We engage in the world as skilled performers within context and culture.

Some may argue that we have moved beyond the expert systems model, and many of the researchers who were involved in the knowledge engineering field have moved to other research areas, yet the concept and the researchers who created it, along with those who still do so, has left a legacy that underlies the large scale data bases in our organisations both in the private and public sector. Bank managers in the UK's major high street banks are now constrained by computerised decision making systems, and if they seek to override the system's decision for a client whom they have formed a judgement about that conflicts with the digital system, they need to find a human in the system to talk to. I have had discussions with senior bank managers who lament the loss of being able to enforce their own judgements, and have experienced junior managers who do not think to question the computerised system's decision but simply input the 'relevant' data and inform you of its outcome. A few years ago, one trainee bank manager told me he was so disillusioned by this computerisation of skill that he was leaving and going to do something that made more use of his intelligence.

‘The collectivity rather than the individual is the location of the knowledge’ (Collins 2013). Collins critique of how far tacit knowledge (Polanyi 1966) can be made into explicit knowledge finds the limits to be in the irreducibility of what he calls the ‘collective’. By this he means culture, that includes how we make *social judgements* about balancing individual and social responsibility; about how the *right way* to do things can only be captured through experience (and not through rules). The knowledge based systems project reduced the collective to the individual and the individual to the cognitive.

ET Hall (1976) describes the process of culture in his ground breaking research on cross-cultural communication, and in contrast to Collins he believes that culture (our own and that which is not ours) must be made explicit if we are to avoid collisions and conflicts. However, when Hall speaks about making culture ‘explicit’, he does not mean this in the sense of the juxtaposition of the tacit and explicit posed by the computer, but rather in terms of human conscious awareness.

“What gives man his identity is his culture, the total communication framework; words, actions, postures, gestures, tones of voice, facial expressions, the way he handles time, space, and materials, and the way he works, plays, makes love and defends himself. All these things and more are complete communications systems with meanings that can be read correctly only if one is familiar with the behaviour in its historical, social, and cultural context,... once learned, these behaviour patterns, these habitual responses, these ways of interaction, gradually sink below the surface of the mind. ... the hidden controls are usually experienced as though they were innate simply because they are not only ubiquitous but habitual as well. What makes it hard to differentiate the innate from the acquired is the fact that, as people grow up everyone around them shares the same patterns”. (Hall 1976, p.42)

In an increasingly globalised work, for many of us who have grown up in a bi-cultural or tricultural situation, speaking more than one language accustoms us to the fact that people are really very different in the ways they behave, as Hall observes in his example of watching people shifting “from a Spanish to a German way of interacting without their knowing that the shift occurred.” Those of us who speak more than one language experience how our gestures, our vocal intonations and accents change when we switch languages. The practice of language carries the trace of cultural behaviours, and as societies become more multicultural there is a behavioural adaptation with the mainstream culture. Efron’s study (1941) of the minority communities in New York in the 1940s, particularly Italian and Jewish, showed that there is a differentiation between the groups of the later generations, but not between these groups and the evolving mainstream New York culture. Efron was concerned to show that the environment shapes cultural behaviour, that culture is not innate. In his research, he finds features of gestural communication that are motivated by processes in other behavioural patterns of the community to which the gestures belong. For example, he identifies a number of gestural acts that he calls hybrid gestures. This is the combination of elements peculiar to the gestures of traditional individuals of Jewish or Italian communities with ele-

ments found in the gestures of Americans of Anglo-Saxon descent. From these findings, Efron concludes that,

'the same individual may, if simultaneously exposed over a period of time to two or more gesturally different groups, adopt and combine certain gestural traits of both groups'.

Efron compares a hybrid gesturer to a bilingual person who *retains the characteristics of their first language in their performance in the second language*. He found that the assimilated Eastern Jews and Southern Italians in New York City differed from their respective traditional groups and resembled each other. The gestural characteristics of the first generation of Jews and Italians gradually disappeared with the social assimilation of individual Jews and Italians into the Americanised community which was also evolving with their assimilation. Efron concludes that 'gestural behaviour, or the absence of it, is to some extent at least, conditioned by factors of a socio-psychological nature'. One could say that the hybrid gesturer, the person with multi-cultural identity, inhabits a cultural space of betweenness.

Efron's work is the first major study of the hidden rules of gesture and culture, and remains a landmark study of the hybrid identity of multicultural persons. It touches on a starting point of my own research life, to understand how my culturally hybrid self affects how I can know that I have understood you, and how I can know that you have understood me.

Hall quotes Powers (1973): 'man's nervous system is structured in such a way that the patterns that govern behavior and perception come into consciousness only when there is a deviation from plan.' In our everyday lives, we only become aware of 'hidden' rules when someone does not follow them, for example if I reach out my hand to shake yours and you move forwards to kiss my cheek, our greeting will be amusingly awkward. The examples that Hall unfolds for us have more serious consequences. Such hidden rules of culture may be described as *rule-following* (Johannessen 1988)¹, which is a way of doing, whereby the application of a rule is dependent on the situation of the person(s). Our practice shows how we understand something.

Collins (op cit.) uses the examples of riding a bike, driving a car and dancing, amongst other activities, to explain how culture involves the kind of understanding needed to negotiate one's way through traffic (e.g. on a bike or in a car) and knowing how to improvise on a dance step: "Negotiating traffic ... includes understanding social conventions of traffic management and personal interaction such as knowing how to make eye contact with drivers in heavy traffic in just the way necessary to assure a safe passage and not to invite an unwanted response. And it involves understanding how differently these conventions will be executed

¹ See chapter 2 for a summary of Johannessen's discussion of Wittgenstein's philosophy on rule and rule-following. It can simply be understood as: a rule is abstracted from the situation, whilst rule-following is how one behaves in the situation.

in different locations.” Riding a bike in London will be quite a different experience to riding a bike in Delhi, and within the UK, riding a bicycle in Cambridge is different from small country village, and further still, the specific context of riding a bicycle will shape the riding style (‘display of skill’) e.g. going to work through traffic or out across country on a cycling race. And he extends this analogy of culture and the conventions of riding a bike, to that of driving a car. In Italy drivers pass the responsibility for safety to other drivers, they expect the unexpected and cope with it well. This makes it much easier for you to drive as an individual since you do not have to do everything “according to the book” and Collins calls this ‘diver collectivism’. In contrast, British and American drivers Britain or America must take much more responsibility for smooth traffic flow, and tend to meet violations from the rules of this flow with expressions of rage. Collins makes an interesting point that relates to what Hall says about making the hidden rules explicit. He does not consider these descriptions to comprise a set of rules for driving in the countries he describes.

In all the countries there is a form of ‘collective responsibility’, for example in Britain and America if drivers resolutely ran over anyone who stepped into the road or crashed into any car that broke a rule, there would be chaos. What is required in every case is a social judgement about how individual responsibility and social responsibility are to be balanced and the right way to do things cannot be captured in any description on the page. The *right way to do things* can only be captured through experience, and that experience and its application vary from country to country. The explication of the way such things are captured through experience is the socialization problem.

At some level both Hall and Collins share the need to describe our behaviour in order to understand how we are social beings; the difference is that Collins places the limit to description at the level of experiencing, whilst for Hall the details of experiencing need to be made visible in order to handle these cultural differences in a way that facilitates the experiencing within the life world of the cultures one is engaging in.

Somatics and skill

“Negotiating traffic is a different problem to balancing on a bike” (Collins op cit.). Why, and is this the case? The distinction that Collins is making is between what he categorises as ‘collective tacit knowledge’ and ‘somatic tacit knowledge’. He claims that the ‘somatic body’ can be made into explicit knowledge, whereas collective tacit knowledge cannot. He presents the example of the android named ‘Data’ in the American Science Fiction series called *Star Trek: The Next Generation*. Data is being taught dance steps by a Dr. Crusher which he is able to immediately repeat without making any mistakes. Collins argues that us humans would need to practice such dance steps in order to be able to repeat them without mak-

ing mistakes, and he calls this acquiring somatic tacit knowledge. Data ‘has the kind of quick brain’ that could learn how to balance on a bike just as easily as he could learn dance steps. A quick brain is aligned with a ‘somatic limit’.

As Data is so good at repeating the dance steps, Dr. Crusher suggests he improvises with the ones he has learnt in order to be able to ‘dance with verve’ i.e. some style. And he does. For Collins, this is where ‘Star Trek’ goes wrong as improvisation is a skill requiring the kind of tacit knowledge than can only be acquired through social embedding in society. Social sensibility is needed to know that one innovative dance step counts as an improvisation while another counts as foolish, dangerous, or ugly, and the difference may be a matter of changing fashions, your dancing partner, and location. Social sensibility does not come from having a quickly calculating brain, it comes through having the kind of brain that can absorb social rules.

Whilst agreeing with Collins that Star Trek has got it wrong about the android’s ability to improvise, I would suggest that he has also got it wrong in assuming that the somatic dance step can be considered apart from the improvisatory dance step. Putting the example of the android aside, when we learn a dance step, that step improves as we perform it, and each rehearsal of the step improves it. The first part of the process of becoming skilled in practice is to learn the techniques (technique), and then with practice in rehearsal and performance the step becomes a skilled step, as the dancer embodies the step and it becomes part of their person. Collins is assuming that a dance step is something that can be abstracted from its purposive evolution into skilled performance, which is necessarily in relation to other people, whether these people are one’s teacher, one’s fellow dancers, and one’s audience.

In traditional dance such as ballet where there is a clear repertoire of dance steps, would a ballet dancer be considered as only having somatic tacit knowledge but not collective tacit knowledge as they do not improvise on these steps? The more experience they have of performing their steps, the more skillfully will they execute each step. The mastery of a movement has been beautifully illustrated by Ikuta (see chapter two) where she describes how a Noh actress acquires the skill of performing the act of reaching out her hand to catch a snow flake, firstly by learning the precise movement as instructed, then over time using her imagination and placing her person into the act so that it becomes her movement. In their skilled performance of a dance step and the movement of catching snow flake, the ballet dancer and the Noh performer (Ikuta 1990) share the quality of skill essential for improvisation, that of embodying the action with their person, i.e. a personal act of knowing.

Dancing is highly cultural and about communication. In some parts of the world, there is no distinction between the word for dance and for music, and it is part of the rituals that socialise you into the culture. Collins’ claim that the somatic body is something that could be made explicit is problematic as it fragments the body from the person and the culture of the practice, and this has implications for the consequences of its mechanisation.

A more interesting and useful question that he poses is to ask, by what mechanism do humans stay in touch with society and how can one build a machine to do that?

Social beings

Understanding what makes us social beings is studied extensively across anthropology, social sciences, and music. Our social behaviour is dominated by 'complex hierarchies of interlocking rhythms' and in studies undertaken by Hall and his students (op cit), such interlocking rhythms have been likened to a symphonic score (Hall 1983). These rhythms, he suggests, hold the key to the interpersonal processes between 'mates, co-workers, and organizations of all types on the interpersonal level and across cultural boundaries'. Rhythms express the truth of interpersonal encounters.

Even how close we stand with each other is expressed in rhythm, notable when adjusting to cultural difference. Hall called this the proxemic dance (Hall op cit.). A study of conversing 'Americans and Mediterranean peoples', discovered that distances were maintained with accuracy to 'a fraction of an inch', and the process was rhythmic. People adjusted their distances approximately every thirty seconds.

In studies on group synchrony, one of Hall's students (1989, p.168-170) found that children in a playground were all playing in synchrony with each other. On close scrutiny, it emerged that one active girl was skipping and dancing all around the playground, and whenever she came near a cluster of children they would synchronise to her. This girl was 'orchestrating' the movements of the playground.

These examples give us a glimpse into how much rhythm is part of our co-existence and survival as growing children and as adults. If we do not have this survival skill we become isolated. Hall and proposed that depression may have its roots in the person who is out of sync in deep and basic ways.

Hall (1976) found that each culture he investigated had its own beat, tempo, and rhythm. Furthermore, that the behaviours of people embodied the culturally based intervals for corrective action that affect how we connect at the emotional level. For example, the Spanish of New Mexico keep close tabs on each other's emotions so that even slight variations are immediately detected and commented on. This short interval or short cycle on feedback, can create volatility. Anglo Saxons have a long time interval, long feedback cycle, taking mood shifts for granted and avoiding interfering or intervening in others lives. People frequently feel they are alone and that it is right and proper they should be able to solve their own problems. When things go wrong it only becomes obvious when it is out of hand.

Rhythm is a powerful dimension of identity and culture. The proxemics example of people adjusting a fraction of an inch at a time to cultural differences in proximity whilst moving every thirty seconds around a room as they are standing

and talking, illustrates the power of interpersonal synchrony but also shows what happens when this lacks mutual adaptation of the cultural embodiment of space. Hall found that few people can function unless it is within the limits of their own rhythm system (culture). He addressed the need for differing rhythm cycles of cultural identity to calibrate especially in cross-cultural communication, and that if different systems are not calibrated, unless a deliberate and successful effort is made to bring them into phase, the interaction could be problematic.

The everyday act of a human greeting is incredibly complex and rooted in the rhythms of culture. We shake hands, hug each other, kiss on cheeks, etc. Greetings are highly culturally variable (Duranti 1997, Garrick Mallery 1891): Maori rub noses, Russians kiss on the mouth, and Japanese bow. But universally, irrespective of culture, these bodily acts are about gauging one person's sense of another. Greetings are essential to giving us a chance to trust in the communication that will unfold and affords us time to achieve the possibility of mutual synchrony later in that unfolding (Condon 1970). The greeting is a parallel coordinated act, and the mutual synchrony of body and voice in greetings expresses "a commitment to communicate" that may be likened to a form of phatic communion (Malinowski 1923) for social bonding.

In the field of music psychology, Cross's works on music and sociality (Cross and Woodruff 2008, Cross 2006), music and evolution (Cross 2011), and music perception proposes that music is fundamentally social and bodily, and that the relation between music and movement in time is evolutionary and cognitive. This relation shapes our capacity to both perceive and anticipate when an event, be this a gesture or vocalisation, is going to occur, and to mutually respond to it in coordinated time. Cross has developed the concept of 'floating intentionality', which brings together the idea of shared intentionality from pragmatics in language (Sperber and Wilson 1986) and intentionality from a musical context, that is intrinsic to both these domains. He makes the distinction that language is primarily transactional and music relational (Cross 2011).

Linguistic models focus primarily on turn-taking structures that can be considered outside the dynamics of experiencing in time. Recently, Levinson (2011), director of the Max Planck Institute for Psycholinguistics, has begun to build a bridge between music and language that considers the temporal dynamics of the turn-taking structure as possibly facilitating the rhythmicity in speech and also orienting us towards a positive convergent outcome.

If knowledge is skilled performance, and dialogue is skilled performance, and skilled performance is rhythmic, and knowledge is formed and shared in dialogue, then knowledge is carried in rhythm.

Data and Dialogue

In the last chapter, the expert system provided an extreme example of the cognitivist paradigm of human knowledge and skill against which to explore the limits of this paradigm for capturing tacit knowledge (cf. Polanyi 1966).

The discussion below will collapse the distinctions made between *knowledge* and *skill* that consider these as distinct ways of knowing, by considering knowledge as skilled performance where *skilled performance is dialogue*. The meaning of data and information, the role of imagination and reflection, and the use of language to express oneself, will be explored through various case studies.

Following my apprenticeship with the Swedish Centre for Working Life (SCWL) in the late 1980's I undertook some case studies of skilled performance in different areas of 'expertise'. The first study was about creating a knowledge base for consultancy practice. As a result of presenting a paper about tacit knowledge at a British AI conference (Expert Systems, Gill 1988), the chairman of the conference session invited me to join a workshop on consultancy organised by his consultancy company. The workshop formed part of a comprehensive process that sought to transform the company's corporate identity. This was a large multinational, and at that time its members did not have a corporate concept of 'consultant'. They performed in their jobs as 'experts' in specific areas of work, e.g. financial, engineering, etc. However, to keep up with the times and be competitive, the company decided to develop the concept of consultancy and reconstruct its identity. This necessitated asking its highly skilled 'experts' to articulate and think of themselves as 'consultants', something they were unfamiliar with seeing themselves as. My role was to 'elicit' the tacit dimension of their knowledge formation as they underwent this process in the workshop. The ultimate goal was to develop an interactive and intelligent multi-modal knowledge based system for training experts to become consultants. Unfortunately, it was not possible to video or audio tape any of the interactions due to sensitivity and confidentiality. During my week with these experts (sales, engineering, marketing, top management, computing, etc.), I experienced many forms of expression of practice and experience being used to build the identity of 'consultancy', such as role play, cartoons, metaphors and video film. The following is an example of 'consultancy' performance that took place during the week long consultancy workshop.

What does it mean to be a consultant?

A group of four upper-middle and senior management practitioners (experts in their fields) are giving a presentation of about 20 minutes each. They are seated around a table and are provided with an overhead projector to use. Each is given the task to present themselves to the others as a consultant and talk about what a

consultant is, and sell the idea of consultancy to them. I was invited to observe the proceedings of the workshop.

The first ‘consultant’ dressed in a suit and tie, stands facing the group and presents a ‘tool kit’ of consultancy using the overhead slides. This toolkit essentially consists of a list of propositional statements– descriptors, definitions and rules. After a few minutes this consultant has to stop giving his presentation, saying he has lost the thread of information, i.e. the connection between himself and the information he has been presenting.

The second ‘consultant’ dressed more casually but smart, also stands and speaks of how consultants ‘pull rabbits out of hats’ whilst presenting hand drawn overheads of a rabbit being pulled out of a hat and one with the word ‘magic’ in large letters. His forms of expression disturb his ‘clients’ who accuse him of mocking their profession and expertise in what they see as his portrayal of them as insincere or dishonest. His expressions make them unreceptive to his ‘content’.

The third consultant also dressed casually but smart, stands and speaks about rules or conduct and emphasises the good things a consultant does. His handwritten overheads are measured and consistently paced. He is perceived as sincere and the others feel he understands them and supports them.

All these three ‘consultants’ had stood and presented overheads. The fourth consultant remains seated but places himself on the other side of the table to the other three, facing them. He begins to tell them a confidential story of some political rumblings at the top of their corporation. This consultant is very high up in the organisational structure hence he has an authentic voice on these matters. The others become troubled and deeply involved in unravelling the story trying to find out as much as they can and work out the nature of the problem. After 20 min, this fourth consultant breaks the illusion of reality and tells them it was all a story. This is a disorienting experience for the others and they are very impressed by what he had done with them. It was of great interest for me, for this consultant had fully engaged them in the performance of *practical knowledge*, where their *experiential knowing* was immersed with each other’s. It was powerful acting (or it was acting from power) with *audience co-performance*. The fourth consultant has fully engaged his ‘clients’ in the performance of practical knowledge where their experiential knowing was to immerse, each with each other’s. It was powerful acting with audience co-performance.

The second consultant who is seen to offend the others’ moral well-being has in fact given a sound presentation at the level of content. The chairman of the workshop session later showed the doctoral researcher the copy of the overheads by this consultant pointing out that there was actually nothing offensive or wrong in what he was saying. The problem had lain in how he had presented the content and how he was perceived as a person. The third consultant provided the feeling of safety and comfort in his use of moral and ethical forms of expression and a calm, paced voice. He was described as genuine.

In all these performances, the posture, position and clothing of the performers in relation to their ‘clients’ set the stage. If the forms of expression were not em-

bodied (e.g. first consultant), the performance failed, and if the forms of expression did not meet the perceptions of self (e.g. of the moral position of the client as in the case of the second consultant), there was breakdown in the communication process.

This study (Gill, 1995) made it clear to me that what someone knows is expressed in their performance of knowing, hence the study of the tacit dimension of knowledge needs to be considered as a process within dialogue itself, and not outside of it.

Knowledge as skilled performance in Dialogue: underwriters making judgements

This was reinforced by the second case study which took the form of an informal interview with an expert and a novice underwriter, where I applied ideas about how to engage with ‘eliciting’ the tacit through and within dialogue, where dialogue is the method and the observation. This second study (Gill 1995) is of a dialogue with underwriters as they are evaluating insurance applications, and it is taking place at their company.

In the Spring of 1989 I was invited to Bristol by researchers (with Bristol University) who were developing a data base for underwriters that could process applications for life insurance policies. The work on the data base was becoming cumbersome and the processing of all the possible data input categories was creating bottlenecks. The relationship between the knowledge engineers and the underwriters had followed a one way flow, of the knowledge engineers eliciting knowledge from the underwriters using methods from cognitive psychology. The communication was largely functional. I requested to be alone with the ‘experts’, in order to avoid them making associations between myself and what I may be wanting from them, and what the knowledge engineers had been seeking from them. I had the opportunity to talk with a senior underwriter and a junior underwriter for a couple of hours. We sat at a table, with myself seated on one side and they on the other, facing me. They had brought along a set of application forms with them that they laid on the table, and were curious about my presence. I told them that I was not there to extract any information out of them but that I wanted to learn about what they do and spoke a bit about my interest in the tacit and experiential dimension of human knowledge and skill. They were interested and began to talk about their skill, explaining to me what they do by going through each of the forms and thinking aloud as they analysed them. The dialogue was that of a senior expert teaching and imparting his skill to his junior colleague, and to me. As they worked through the information on the forms they built up a clear *picture* of each person represented there and *imagined* their past and future lives, their habits, lifestyles, personalities, values, etc. On the basis of these imaginings they formed judgements as to whether this was someone who could or could not quali-

fy for a certain type of life insurance policy. The experiential knowledge and imagination of the senior underwriter was made available to the imagination and knowledge of his junior colleague who could then follow and work with him to understand the personality and life-style of their applicants.

It was clear from this two hour session that there was no one salient procedure of data processing that could be applied to each form, as each person (each applicant or rather each completed application form) presented a different picture of salient information for the underwriters. It would be problematic to predefine rules for connecting the categories of data on the forms (processing the data) that are rooted outside 'relevance', i.e. outside how the information on the form is meaningful to the underwriter in building a picture of a person.

There are two problems here and they relate to the idea of not being able to see the wood for the trees. If one functions at the level of data and procedures, then one builds composites, but these composites may not form a wholeness, instead they may simply remain a collection of parts. It is the human who can make the wholeness by applying experiential knowing and imagination, but the skill of achieving this may become lost if the system automates the expert's creation of the applicant as the composition of parts. There are undoubtedly corporate factors (around risk and profit) which shape the imaginative construction of the client, but these are not the foci of the analysis. This experience took me back to my early conversation with my Scandinavian mentors about what role imagination, experience, and culture plays in human knowledge. One study by the SCWL group that bears directly on the work with the underwriters is Maja Lisa-Perby's study (1990) of how weather forecasters form an inner weather picture when they make weather forecasts.

Inner weather picture: weather forecasters

Perby studied the skill of meteorologists and investigated the reliability of forecasting by computers compared to forecasting by meteorologists. This study was undertaken in the early stages of the use of computers for numerical forecasting and for automating map plotting. They were being used as it was assumed by management that the computer would help to make forecasting more efficient, due to a belief that the weather forecasting is a process of calculating data.

Perby investigated how the use of these numerical forecasts was affecting the tacit knowledge of the meteorologists, and why given the huge increase in the availability of data, meteorologist found that there was too much and not enough relevant data at the same time. Her study focuses on a group of meteorologists at an airport, where they are providing the local weather forecasts for pilots. The computers were making numerical forecasts based on mathematical models that could predict large scale weather for up to ten days ahead. They provided on average, forecasts for up to 12-24 hours ahead. For the meteorologists, this was not

sufficient for making local weather forecasts which need to be made within 9 hours head. They found their traditional methods of analysing the weather more effective for this purpose, and this is what Perby's study is about. Her argument is that computer solutions tend to be general and standardised whilst skilled work is formed by concrete and specific circumstances. The interest I have in her study is the role of imagination in making the weather forecasts.

Meteorologists look for patterns in weather. Through an integration of information and experiences (for example from colleagues and pilots) presented to them, they build an inner weather picture. This involves assimilating the information, and that gained from personal contact, e.g. with pilots, facilitates them in assimilating other information, even though it is a small percentage of the overall information used. Traditionally the meteorologists have used historical information/observations in their analysis and prediction of the weather. This includes being briefed by their colleagues when they take over the work shift. This briefing provides a 'sign-post'. Their colleague(s) also draws up synoptical maps during his/her own working shift. 'Synoptical' means that the observations are made at the same point of time at all places. The meteorologist also interprets the information against a theoretical model of the strata of the atmosphere. In contrast to the meteorologist, the computerised numerical forecasts contain future oriented information which does not enable the building of an inner weather picture. Hence, even though the availability of information increased with technology, much of it was of no use to the meteorologist.

Traditionally the meteorologist draws up synoptical maps every three hours to form a sequence of maps in order to gain an insight into weather movement. The numerical forecasts produced every 12-24 hours did not provide the detailed and precise information that was obtained from the synoptical maps. This caused the meteorologist problems in interpreting the numerical forecast as each model could be suitable for depicting some weather conditions and not other weather conditions. The meteorologist therefore has to gain experience over period of, on average, a year in order to be able to use a particular model effectively for predicting the weather. Furthermore, they have to cope with an additional problem: the numerical meteorologists keep developing new models. This does not allow the meteorologist to get experience of the models and poses problems for interpreting the information and producing reliable forecasts.

The meteorologists in Perby's study resisted changes that undermined their ability to come up with an inner weather picture. They resisted a division of labour between making and communicating the weather, because this would require the meteorologist who is responsible for briefing to take over a ready made analysis and render him/her unable to form an inner weather picture. Meteorologists also resisted the idea that the synoptical map they produce is a product rather than a working material; they defended the active assimilation of information about various weather elements as opposed to passive reception of a lot of information. An active analysis guarantees a certain depth in the interpretation of the information.

The study was a project between Lund University and the local weather forecasting service at Stirrup. Perby's study showed that increased information through computerisation did not mean greater reliability in decision making. In weather forecasting, skill lies in the ability to select and interpret information, and using historical material to build an inner weather picture. In order to build such a picture, the meteorologists spent time reflecting and digesting the information. Computerisation and cost 'efficient' methods placed less importance on reflection and therefore on the processes of understanding which is facilitated through a variety of sources of knowledge such as talking to colleagues over tea and communicating with pilots. Perby's expectation was that the systematisation of the practice of weather forecasters that places an emphasis on formal knowledge would lead to a loss of skill and deterioration of their inner weather picture, their tacit knowledge.

The Expert and the Mediator

The above examples of consultancy, underwriting, and weather forecasting, present an understanding of knowledge as it is expressed in the performance of expertise. Expertise is not reducible to a matter of representation, but lies in dialogue, communication and conversation, reflection, and imagination. Thereby 'data' or 'information' taken from its living context loses its meaning; it becomes re-defined if we seek to reconstruct it within a system of rules. The project of the knowledge based system assumes that an expert has all the knowledge needed to perform their expertise in practice and that he/she is an autonomous decision-making entity. The examples above along with studies in the field of the sociology of scientific knowledge, show that this is a limited and misplaced picture of expertise. The next example is from my doctoral work (Gill SP 1995) and is a critique of the basic unit of knowledge that might be represented in a data base, i.e. that of data itself, by analysing its life within dialogue, its living context. The critique is situated within a quest to understand what is the relationship between the tacit and the explicit dimensions of knowing as they unfold in dialogue, i.e. how knowledge is acquired and transferred in dialogue, and it questions the concept of the autonomy of an expert.

The study of is of the meetings of a design team in a company, who are creating an audio-visual communications infrastructure in their building, which is architecturally not conducive to unplanned interaction as it separates the space into two pod areas per floor, where each pod is a square with offices. People find it very difficult to know what is happening with others at any time unless they send an email or phone them or go to the top floor where seminars are held and where people can eat their lunch. The aim of the audio-visual infrastructure is to increase awareness of what is happening at any time. I had an opportunity to track the design team's discussions, primarily their team meetings. This involved participatory

observation, which included making video and audio recordings, as well as conducting informal interviews, and partially inhabiting the space as an affiliated researcher.

To begin a critique of the life of a piece of data in dialogue, I considered what might count as salient information in the design meeting, such as ‘topics’ discussed. For this inspiration I have to thank Judy Olson (from the field of human-computer interaction, HCI) who was researching the processes in collaborative design, and in her analyses of salient events during a design discussion she had the category of topics. I selected ‘topic’ as a data entity, bearing in mind that the etymology of topic, *topos*, is ‘place’. I identified topics that were raised in the conversations of the audio-visual design team and treated these as ‘information’.

In analysing the nature of this ‘information’, I traced the path(s) of each topic and found that where a topic began there was a discrepancy in knowledge amongst the team. A discrepancy could be that someone does not have the information that another person assumes they have; it could be that a person’s status makes their contributions less credible and they are ignored; it could be differences in experiences and opinion about an event; or it could be that the ways in which a person expresses some information is not being perceived in the intended way, etc. There are many factors that give rise to a discrepancy in knowledge. What I found is that the end of each discrepancy coincided with new salient information being raised, i.e. a new topic, indicated by a move for a topic shift. At that moment the discrepancy is resolved, or at least a consensus reached such that the conversation could move forward, or alternatively the person with the [corporate] authority in the team decided that there was no more time to spend on the topic and closed it and initiated a new one. The last scenario of closing a topic by force is unstable as there has been no mutual agreement even to disagree.

Quite unexpectedly, the quest to understand the relationship between the tacit and the explicit dimensions of knowledge in dialogue had become an analysis of the nature of discrepancies in communication and the means by which we can become aware of these discrepancies and resolve them. And the critical factor in becoming aware is the *mediator* of the discrepancy, and I shall explain what I mean by this below.

The design team that I was following was composed of five persons; four men and one woman of whom one was the Director of the Company. Each had a particular skill in a specific knowledge domain (hardware engineer, software engineer, user-designer relations, free thinker, Director). The Director of the Company (also the chairperson of the team) chose four people to represent the salient elements necessary for the successful design of this technology in a complementary way.

The topics that I identified within the conversations held discrepancies that unfolded different patterns of dialogue. For example, one of the topics revolved around a gap in knowledge between two people where one is talking from within his expertise and the other is trying to engage with him outside of his own expertise. This necessitates some third party person who can bridge the gap. This sce-

nario of mediation comes most readily to our minds when we think of the word mediation in the context of communication. However, we would typically assign the person who lacks the 'expert' knowledge to be the problem of the gap in communication, whereby a mediator will bridge the gap by helping the expert to provide the necessary information to the other person who lacks it. This is a mistaken picture and it is probably rooted in what Hall called the identity extension transference (see above) where we assume that the problem in communication lies with the other. In the context of the design discussion, the mediator was able to make the 'expert' understand that in fact he (the expert) had not understood the nature of the design problem that he was supposed to be responsible for and that this is the gap between him and the non-expert, not the lack of knowledge of the non-expert. The problem in communication lay with the expert, i.e. as Hall says we need to come to realise that the problem with the other is me.

Another scenario, which does not come as readily to mind when we think about the meaning of mediation or mediator, is where many people are recalling something such as an event or a past conversation, and they remember different things about their experience of it. This happens to us in every day life, and popular example shown in movies is of a couple who recall the day they first met, such as the clothes they wore and what they said, and each corrects the other's memory. Sometimes when we are relating a shared experience, say at a dinner party, we can be swayed by a friend's conviction that what they saw happening was what happened and not what you remember, and you find yourself aligning your story with theirs. In the design team, there is some confusion around the problem of lighting in one part of the building that can be seen by everyone in the group, as all the offices and all the spaces in the building (except for one space in the eating area on the top floor) are connected by the audio-visual system. Each member of the team remembers something different about the view, and some change their mind based on what another one says: 'I cannot see a very clear view through that camera lens', 'that area looks very dark', 'maybe the light is on too low', etc... As the designers in the team share their experiences, one of them says something pertinent, the name of a particular camera lens. At that moment the 'expert' amongst this chattering of recalled autobiographies hears this pertinent utterance and suddenly realises what the problem is, and solves the matter that he now understands is with the camera lens. The person who said something pertinent is the *mediator* of the problem, and made the person who can solve the problem aware that they are in fact the 'expert' for this problem.

In both scenarios, the 'expert' in the life of the topics that I analysed did not see what the design problem was. It is someone else, whom I term the 'mediator', who provides the key to solving the source of the differences of opinion and perception about an issue. The mediator does so with the precision of the appropriateness of their utterance at the right time and in the right style and in the right role. The only person who can recognise the mediator of the problem is the 'expert' for the problem, i.e. only the expert for the problem can recognise the key as being the key and know how to use it.

There are three points to be considered:

- The first is that the concept of an autonomous expert is artificial and not grounded in human praxis;
- The second is that expertise is distributed in mediation;
- The third is that there is a relation between mediation and tacit knowing in human relations.

Mediation process

Next it is helpful to look into the structure of the mediation process, in light of the examples given above. It is proposed that the mediator enables resolution in discrepancy and consensus in knowledge by being empathic with the critical discrepancies (Gill SP 1995). By empathic I do not mean sympathetic, but rather I mean an aesthetic quality that is akin to aesthetic emotion, for example, of our personal resonance with the structures, textures, forms and colours of a painting, as well as the theme presented (e.g depicting a landscape, people walking in the country side, etc). Imagine you are viewing a work of art, you experience the work as a whole yet you have an awareness that it is composed of the brush strokes, dots of paint, textures of paint, and colours. Together, these particulars enable you to see the picture and experience any aesthetic pleasure it may give. These particulars, marks on the page, form patterns of recognizable human forms, forms of nature, artifacts, and a narrative, i.e. they give us a mediated quality of meaning and affect. Polanyi (1966) said that we attend from the particulars of a work of art to attend to the aesthetics of the artist who created it. Within human interaction, such particulars may include the forms of expression (the gesture stroke, the intonation of the voice, the rhythm of the body and voice), a person's style, a person's role in relation to others, and the kind of knowledge they are expressing (e.g. narrative form - are they talking about an experience they had the other day whilst walking into town; or descriptive form - are they describing the dress they saw in the shop; or propositional form- are they giving you instructions on how to say run a particular software you need to use). Our perception of these particulars, that is evident in how we engage with them or not, affects how we understand what someone says. I call such particulars in human relations, compatibilities, *whereby particulars become relational*; empathy is the compatibility and ability to generate shared understanding with respect to a particular combination of compatibilities where compatibilities include levels of knowledge, forms of expression, personality, role, etc.

Hence, when a mediator in the design group utters the key to the problem of the poor view, there is a resonance between the mediator and the problem, and between the mediator and the expert, hence the mediator mediates the key to the problem to the expert, enabling the expert to resonate with and solve the problem. Neither are attending to the particulars but attending from them to see the problem. The mediator's personal act of knowing is distinct from that of the expert's in

that the mediator cannot solve the problem. Furthermore, once the expert recognises the problem, all the participants in the group become aware that the problem has been identified.

Mediation is needed to provide the bridge for the particular discrepant aspects of the tacit and explicit dimensions of the knowledge in the communication to meet, and enables the participants to share awareness of the tacit dimension of the discrepancy.

Hence, the success or failure of knowledge transfer in dialogue is dependent on how knowledge (content) is carried and shaped in dialogue, and this includes discourse processes and group dynamics. Dimensions of knowledge (content) considered in this study are propositional, experiential and personal, knowledge by familiarity, and practical. These modes or categories were arrived at after reflecting on how to apply ideas about tacit knowledge that have been developed in discussions on skill, to analyse the relationship between the tacit and explicit dimensions of knowing within the processes of dialogue. Hence, these are not categories in a strict taxonomic sense.

- *Propositional knowledge* is domain specific knowledge, or knowledge, which can be expressed in the form of rules, made explicit, and is non-personal and non-experiential. In this case study the term propositional knowledge covers technical knowledge, rules about the use of the technology, descriptions of the functionality of the technology, knowledge which has the status of fact ('The menu, it says glance'), design issues (privacy), and design topics (background, glance and sweep connections). The range and variety of expressions just listed are specific to this design context. For example, if the context were that of a conflict between parents and children, between lovers, between a teacher and children in a classroom, within a courtroom, etc., the variety of possible expressions are expected to differ.
- *Experiential knowledge* is that which comes from one's own direct experience, or it is cultural/social knowledge², or it is knowledge of another's experience (that one can relate one's own experience to, or imagine with). Experiential knowledge includes autobiographical information, which is personal knowledge. This may be either direct experience which is indicated by the use of personal pronouns such as 'I', 'we', etc. (I had a delicious lunch); or generic knowledge³ (a frequent experience: 'whenever I do...'), or episodic knowledge⁴ (a specific experience: 'the other day I was...').

² This may be general knowledge e.g. of a specific culture, or specific experience e.g. work based, gained from interaction with work colleagues, group culture.

³ This is based on the idea of generic structures in memory, which summarise similar events, cf. Barsalou (1988) i.e. refer to memory descriptions which refer to repeated actions over extended periods of time, e.g. 'we also went to the movies while we were there; everyday we would leave our house' cf. table 8.1, p.200.

⁴ This is as in episodic memory, cf. Tulving (1972). Episodic memory refers 'to

Experiential knowledge encompasses how people use their knowledge and how they can relate their knowledge appropriately to specific problems. It encompasses practical knowledge.

- *Personal knowledge* is that of the individual personality, expressed as values, beliefs, and emotions. It is influenced by society, culture, family, education, friends and work colleagues.
- *Knowledge by familiarity* is the use of examples by a speaker to help the transfer of knowledge by opening the dialogue to engage the other(s) from their own experiences, and thereby help bridge discrepancies. Examples illustrate a person's knowledge and invite others to connect at that person's level or kind of knowledge.
- *Practical knowledge* is the skilled performance itself. It can be inferred but not made explicit: decisions, judgements, analyses, indicate (point to) practical knowledge but do not represent it.

Through dialogue, participants may acquire knowledge or fail to do so, and the dialogue may alter their group (collective) knowledge, and achieve dynamically stable knowledge⁵ and build trust. Knowledge acquisition is successful when the communication between participants is consensual and compatible. Knowledge acquisition fails where no compatibility in communication can be established around the source of the problem and for it to be solved. If one were to perform a knowledge engineering exercise on these dialogues, one would face a problem that is reminiscent of, but of far greater complexity, to that of the example of the underwriters when they are making sense of the information contained within an application form to imagine a person's life - the relation between content and processes in communication is orthogonal and cannot be predefined. Knowledge is a process embodied in the dynamics of dialogue and the persons involved.

Hence propositional knowledge can be expressed in a variety of ways. It can be effective if both speaker and listener share the same knowledge base. If they do not, then it is not effective and you have breakdowns and misunderstandings. I was communicating with David Smith about this recently. David has been working in the area of knowledge transfer and tacit knowledge for many years, and he

situations in which a person remembers an experienced event which contains spatio-temporal knowledge (i.e. details of time and place)' cf Conway(1990) p.3.

⁵ The term 'stable' refers to a person's relation with their knowledge and is used in a colloquial sense, as opposed to a scientific sense, i.e. it does not mean that knowledge is in a state of stable equilibrium. It denotes an individual's ability to have acquired the knowledge such that they can use it in a sustainable manner; a kind of psychological state whereby someone can maintain their performance of the knowledge over time. This may be behavioural, involving automaticity. In this case one is not necessarily consciously aware of one's knowledge. Stability of knowledge may also exist where someone has confidence in using their acquired knowledge. It requires the person to be true to themselves.

brought my attention to how we may also *know differently*, depending on our *cultural frame*:

'If I grow up in a society which explains certain phenomena and events in terms of (say) sympathetic magic, I will 'know', understand and use those phenomena differently from someone whose cultural frames include "science". I've come across this in Africa many years ago.

A friend of mine (early 70s) was a Malawian, educated in the UK. He came back with a shiny degree to work in agricultural development. One of his tasks was to visit villages and set up demonstrations of modern (small-scale) farming practice. He told me that in his first season, he'd duly been to villages and selected likely partners, then worked with them to use fertilisers and pesticides. At the end of the season, back to the villages to call meetings, and lo!, the trial plots had tall, healthy maize of much better quality than other peoples'. QED? No! The inevitable question was along the lines of "Why have you done this to us? If you had not persuaded our kinsma to put this mankwala (medicine) on his land, our crops would be just as big as his!"

He realised that the villagers lived in a cultural frame in which sympathetic magic provided an accepted and engrained everyday explanation for such events. In this situation, there was nothing unreasonable or illogical about their responses. What was illogical was to expect them to abandon this frame simply on the flimsy grounds of a facile demonstration. Result - major re-think of demonstration farm strategy.

Culturally located conceptual frameworks may be "wrong", but intelligent people will use the frameworks they have to draw robust and (internally) valid conclusions, especially where more "correct" alternatives appear both counter-intuitive and less robust."

Background to the knowledge categories

I have mentioned above that I had drawn upon a range of discussions and research on tacit knowledge and human skill to arrive at the various modes of knowing in order have a way of analyzing the relationship between tacit and explicit dimensions in human dialogue and they include the works of⁶ Cooley (1987), Goranzon and Josefson (1988), Rosenbrock (1990, 1992), Gill KS (1996), Gill SP (1996), Rauner, Rasmussen and Corbett (1988). Cooley and Rosenbrock's fundamental work on human-centredness laid the ground for a movement that questioned the depersonalised automation of human skill that assumes the personal is not significant for skilled practice. Although a skilled engineer uses scientific knowledge and mathematical analysis, his/her skill also "contains elements of experience and judgement, and regard for social considerations and the most effective way of using human labour. These elements partly embody knowledge which has not yet been reduced to an exact mathematical form. They also embody value judgements which are not amenable to the scientific method" (Rosenbrock, 1988).⁷ In the seminal book *Architect or Bee*, Cooley, describes how the relative levels of the subjective and objective aspects of knowledge which a person utilises vary as one gains expertise. An expert uses more of the subjective aspects and less

⁶ See chapter two for details.

⁷ Rosenbrock, H (1988) *Engineering as an Art*. AI & Society Journal, Vol.2 No.4.

of the objective aspects of the knowledge in, for example, the use of intuition. An expert has the ability to grasp the situation in front of him/her and make judgements about it. A novice, on the other hand, can only calculate by using explicit rules to make sense of what appears to him/her to be a mass of data. (Cooley 1987).

I also drew upon work in autobiographical memory research for the category of experiential and personal knowledge (Conway and Bekerian 1987; Bekerian and Dritschel 1992), in particular the role of personal history in the organisation of specific autobiographical memories. Bekerian (at the former Applied Psychology Unit, Cambridge) and her colleagues showed how personal history cues access autobiographical memories, whereas cues that the person cannot relate their self to are less likely to do so. They found that autobiographical memory may be organized in a hierarchy of kinds of personal information that ranges from abstract to specific knowledge, where more abstract levels of the hierarchy are the thematic aspects of a person's life that include such things as location, activities and time period. These abstract levels can index more specific levels,⁸ for example, 'I remember a time when I was in my teens and dreamt a lot', or 'a mother was remembering a time when her children were growing up during which she was doing a lot of housework'. Life period themes ('I remember a time') are fairly common across people, therefore individuals may represent these periods in terms of 'culturally specified norms'. (op cit. p.130). Autobiographical memories may also be accessed through 'contextual cues' such as odors, sounds, etc. At the time that I met her (as her PhD student), Bekerian was consulting for the police. She had found that the police were selective in their judgements about what counted as 'evidence', limiting it to what could be proven either by witnesses or by some other empirical evidence, and in both the questioning during an interview and analysis of the case, what was perceived as being a personal matter, including a personal memory, was left out of the case records. Yet asking questions that trigger personal memory can be important for accessing memories that provide 'evi-

⁸ Conway and Bekerian (1987) conducted three experiments to investigate timed autobiographical memory retrieval to cue words and phrases. In the first experiment, subjects retrieved memories to cues that named semantic category members and were primed with the superordinate category name or with a neutral word. No prime effects were observed. In the second experiment, subjects retrieved memories to primed and unprimed semantic category cues and to personal primes and personal history cues. Personal primes named lifetime periods (e.g., "school days") and personal history cues named general events occurring in those lifetime periods for each subject (e.g., "holiday in Italy"). Only personal primes were found to significantly facilitate memory retrieval. A third experiment replicated this finding and also failed to find any prime effects to primes and cues naming activities not directly related to an individual's personal history. In this experiment, characteristics of recalled events (e.g., personal importance, frequency of rehearsal, pleasantness, and specificity of the memory) were found to be strongly associated with memories retrieved to personal cues and only mildly associated with memories retrieved to other types of cues. These findings suggest that one way in which autobiographical memories may be organized is in terms of a hierarchically structured abstracted personal history.

dence'; research in autobiographical memory shows that semantic, situational and personal knowledge are connected in memory. Furthermore, asking questions that connect to personal memory can access other information more effectively and in a shorter time than impersonal questions (Conway et al. op cit.).

The category of practical knowledge was drawn from Goranzon and his group's work at the Swedish Centre for Working life (1977-1989) on dialogue and tacit knowledge. This work, that developed and applied a hermeneutic approach to understanding knowledge and skill, sought to understand why there was a loss in the ability to make judgements on the part of the professional, during the mass application of information technology in organisations in Sweden in 1970s and 1980s. Goranzon (1992) argued that in traditional approaches to knowledge and skills, importance is given to propositional knowledge at the expense of practical knowledge and this includes not recognising the importance of communication amongst professionals in their practice. What his group called 'knowledge by familiarity' is completely left out. Knowledge by familiarity is acquired from learning within a practice by seeing or examining examples of the tradition in the work. One member of this SCWL group, Josefson (1988, 1992) focused on knowledge by familiarity in her work with nurses where she engaged them in philosophical work that they could relate their practical life to (e.g. Wittgenstein's *Philosophical Investigations*) and narrative works (Ancient Greek and other fiction) to enable them articulate their practical knowledge and thereby evolve a language of nursing practice. She held that propositional forms are an important feature of practical knowledge, tested and validated through the experience of unique events (each patient case), and assessed by similarities and disparities with previous examples. Any practice consists in rules and examples.

All this above discussions from human-centred systems, dialogue, and autobiographical memory in some way question the separation of the explicit from the tacit, the objective from the subjective, the semantic from the situational and personal. A traditional cognitive approach (e.g. as in Jerry Anderson 1983) would say that practical knowledge is procedural knowledge, and can be represented as an algorithm of some kind. That is, it can be represented as a set of rules about how you use your knowledge which are based upon a summary of the content of experiences. The approaches I have drawn upon argue that one cannot represent all of experiential knowledge as a set of propositions or as an algorithm. One can relate some content of autobiographical information to propositional knowledge, e.g. 'my car is red'. But one cannot easily represent reactions of self, i.e. emotions, attitudes, values, beliefs, as propositional knowledge.

I adapted the various concepts in the discussions on skilled practice (see Chapter Two) in order to apply them to the analysis of dialogue. The work on autobiographical memory was based on the analysis of discourse and hence the concepts were transposable for the design team discussions.

Mediation process continued

To return to mediation, the conventional model that most of us are familiar with is that this is something that a person does in resolving dispute situations or in facilitating a meeting (e.g. a chairperson). This person serves as a conduit of information between the parties concerned, and is a go-between. In this study, mediation is considered as the mediation of discrepant knowledge within a knowledge environment, where a mediator serves to clear the noise, so to speak. The conventional model is one form of this.

Within any conversation (knowledge environment), we sometimes meander around a topic talking about things that may not seem to be necessarily relevant to it. In the case of a dispute or a difference of opinion, or in a group meeting where people are trying to brainstorm over a problem, such meandering may appear irrelevant (e.g. rhetorical) to the particular problem by the various negotiators or participants involved. Yet such 'irrelevant' information may be functioning to sustain the dialogue and open opportunities to discover the source of problems and clear up the noise. The belief of 'the one best way' (cf Cooley 1987) to do things in order to achieve a goal and produce an outcome, permeates perceptions of what constitutes relevant information and the analysis of salient paths for problem solving and decision making. However this can miss the relevance of verbal and non-verbal contributions that serve to move the discussion and support the emergence of ideas, solutions, and decisions, just as in my conversations with the underwriters. Likewise, in the perception of what counts as evidence in police interviews Bekerian (see above) found they left out personal memories, deeming them irrelevant to the case. In fact, in any dialogue, take for example a dinner party or a business meeting, 'topic irrelevant' interventions can create the possibility for someone to emerge out of the 'noise' and perform a mediating role that causes people to rethink the nature of the gossip or the source of a design problem.

In one of the design team meetings, during a period of 5 minutes there were three topics identified in the discussion, and each topic carried different kinds of discrepancies in the knowledge of the participants. In each one, a different person emerged as a mediator.

The study drew three basic requirements for a person to be a successful negotiator or mediator:

- (1) Understanding the other; or understanding the situation of discrepancy in the knowledge environment (i.e. amongst two (or more) participants).
- (2) Knowledge of the gap between oneself and the other; knowledge of the gap in the knowledge environment (e.g. amongst the participants).
- (3) Ability to express this understanding and knowledge to other or others, i.e. produce the bridge.
- (4) Only the person who can solve the discrepancy recognises the mediator.

It is not sufficient to understand the nature of the discrepancy nor to have the key knowledge; one needs to be able to convey this in a form that others can perceive and that thereby makes sense to them. Personality also played a role as this

influences the perceptions people have of each other, and affects how they understand the information being expressed, as shown in the consultancy study above.

The analysis of the tacit and explicit dimensions of communication for knowledge transfer and formation, supports the finding from the consultancy study that embodiment of forms of expression sustains one's own performance and engagement with others (dynamically stable knowledge). Various kinds of knowing form the tacit dimension in communication. The explicit, e.g. in this case a topic, or something that could be constituted as being a piece of data, is a process within dialogue, and a critical factor in the formation of knowledge in human communication that is necessarily a personal act of knowing, is mediation. Polanyi's concept of tacit knowing has a mediational structure (JGill 2000) of integrating our attention to something from our awareness of its particulars. It is this quality and in this sense that I assign the expression mediator to a person in human dialogues. The mediator is a mediator because the 'expert' or the person who needs to grasp the source of the problem in order to understand how to resolve it, does understand that whatever the mediator has expressed shows them this possibility. The expert recognises the mediator. *Mediation is not an individual's action (be this a gesture or/and an utterance), but a collective moment between the mediator and the expert (i.e. two or more persons), and once the expert recognizes the mediator in his/her response, the whole group also understands that the source of the problem has been identified.* This in part supports Collins' (op cit.) category of collective tacit knowing as being irreducible to the explicit, which in this case would be of 'expertise' being reduced to an 'autonomous expert'.

Conclusion

Dialogue is skilled performance, and since knowledge is carried in dialogue, knowledge is skilled performance. Dialogue is improvised, and at its best it flows and feels good and we feel connected. I was asked recently that if a person speaking were speaking in Chinese to someone who speaks in Japanese where neither can understand the words (speech content) of the other, would they be transferring knowledge? I would say they would be, and of the kind that underlies our everyday contact with others we encounter in our lives. It is of the kind that was crucial for my Japanese colleague (chapter one) to make sense of my utterances where neither I spoke fluent Japanese nor he spoke fluent English, but which was inaccessible to him in the video conference setting to the extent that he could not understand what was said and know how to engage. Someone whom I met briefly at Stanford spoke of her experience of ordering food in a restaurant in France whilst visiting with her husband. She is deaf, her husband is not and neither spoke French well. He had tried without much success to make himself understood to the waiter using his poor French, so she gave it a try, and using gestures and sounds, she was able to convey their needs with success. Her husband had attended to words, she

had attended to movements and sounds that would engage the waiter. Such improvisation is not about the one best way, nor is it possible to abstract it outside the person(s) involved in it; it is a personal act of knowing. It is not about certainty but about moving with uncertainty. Certainty blocks it. Yet we build technologies of information of certainty for certainty. Such technology caused the skilled mathematicians in the Swedish Forestry Commission (Goranzon 1988, 1992) to lose their ability to trust their own judgements when using the knowledge based system that they had been involved in creating.⁹ Certainty gradually caused them to doubt their uncertainty and to pass over judgements to the computer. The senior bank managers whom I spoke with are from an era when they were expected to make judgements about a client, and they lament this wall of certainty of the data base which they have to feed information into and that computes decisions which are sometimes contrary to what they think. They try to find humans in the system in attempts to override this computation if they can, whilst there is a generation being trained to accept these abstract decisions and do not know how to judge or are not encouraged to judge.

The dominant model of expertise with its premise that an expert is an autonomous cognitive entity has shaped the concept of the knowledge based system and its zenith, the expert system. However, expertise is about being able to improvise which necessarily is about handling uncertainty and working with doubt. Handling uncertainty involves mediated awareness. For example, for the weather forecasters, this occurs in their tea break discussions with colleagues and in reflection. The skilled ‘consultant’ created an imaginary world to engage his colleagues in thinking through a problem that they believed to be real, and the underwriter and weather forecaster formed an inner picture to understand the problem. In the examples from the design team meetings, it was not the ‘expert’ for the problem who grasped its nature, but a ‘mediator’ who made the expert aware that he/she is the expert for it. In all these, expertise is not conducted autonomously. It is about engaging in the world as skilled performers within context and culture and this involves, *knowing that, knowing how, and also knowing when*. The personal act of knowing, of being committed to know, is necessarily embodied.

A visceral example of this is Chesley Sullenberger’s landing of US Airways flight 1549 on the Hudson River in 2009 where all the passengers survived. Within minutes of leaving New York’s la Guardia airport, and at a height of just 2818 feet, the plane struck a flock of geese flying in perfect formation towards them and lost thrust in both its engines. Sullenberger took over from his co-pilot and decided not to fly back to La Guardia or over dense population but to head for the Hudson River. After gliding the plane over the George Washington Bridge, he picked a stretch of water near Manhattan’s commuter ferry terminals to land, where rescuers were able to reach in minutes. All this analysis, communication, and decisions took place in the three minutes from the engines cutting out to landing the plane. Sullenberger’s 40 years of experience of flying, combined with his experi-

⁹ See chapter two.

ence in handling and understanding risk and safety, and also his personality, helped him to skillfully navigate the plane and in trust with his co-pilot. It is interesting that those who knew him were not surprised that he was able to do this, commenting, 'he is an unbelievable professional', 'he was the right person to help passengers survive a crisis'.

Skill, be it Sullenberger's flying of the plane or a dancer's beautiful step, has an aesthetic quality. Aesthetics, along with ethics, has been considered to lie outside the realm of explicit or propositional knowledge (Ayer 1971) because they are not in full measure linguistically articulable and are not scientifically relevant. Flying a plane like Sullenberger or dancing a beautiful step requires a great deal of skill, and it is acquired in an apprenticeship, and it is in this way of learning that people develop both an ethic and an aesthetic of quality performance (Smith 1992). Within dialogue itself, mediated awareness may be said to be aesthetic. The study of the design team meeting showed that mediation involves empathy, which in turn embodies aesthetic emotion arising with the resonance in the confluence of compatibilities between the expert and the mediator.

This conceptualisation of empathy is to be explored further in the next chapter on our bodies and the mediation of knowledge in human interaction. There we continue the discussion on how co-presence in physical space facilitates the transfer and acquisition of experiential knowledge. The methodology for understanding the tacit has so far drawn on dialogue, discourse analysis, ethnomethodology and participatory observation, and now extends to include ethnography.

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