Do we really understand tacit knowledge?

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Abstract

This paper advances the claim that tacit knowledge has been greatly misunderstood in management studies. Nonaka and Takeuchi's widely adopted interpretation of tacit knowledge as knowledge awaiting "translation" or "conversion" into explicit knowledge is erroneous: contrary to Polanyi's argument, it ignores the essential ineffability of tacit knowledge. In the paper I show why the idea of focussing on a set of tacitly known particulars and "converting" them into explicit knowledge is unsustainable. However, the ineffability of tacit knowledge does not mean that we cannot discuss the skilled performances in which we are involved. We can discuss them provided we stop insisting on "converting" tacit knowledge and, instead, start recursively drawing our attention to how we draw each other's attention to things. Instructive forms of talk help us re-orientate ourselves to how we relate to others and the world around us, thus enabling us to talk and act differently. Following Wittgenstein and Shotter, I argue that we can command a clearer view of our skilled performances if we "re-mind" ourselves of how we do things, so that distinctions, which we had previously not noticed, and features, which had previously escaped our attention, may be brought forward. We cannot operationalise tacit knowledge but we can find new ways of talking, fresh forms of interacting and novel ways of distinguishing and connecting. Tacit knowledge cannot be "captured", "translated", or "converted" but only displayed and manifested, in what we do. New knowledge comes about not when the tacit becomes explicit, but when our skilled performance is punctuated in new ways through social interaction.

> "Nisi credideritis, non intelligitis" ("Unless ye believe, ye shall not understand")
>
> St Augustine (cited in Polanyi, 1962:266)

> "Something that we know when no one asks us, but no longer know when we are supposed to give an account of it, is something that we need to *remind* ourselves of"
>
> L. Wittgenstein (1953: No.89; italics in the original)

> "The act of knowing includes an appraisal; and this personal coefficient, which shapes all factual knowledge, bridges in doing so the disjunction between subjectivity and objectivity".
>
> M. Polanyi (1962:17)

It is often argued that knowledge is fundamental to the functioning of late modern economies (Drucker, 1993; Stehr, 1994; Thurow, 2000). "What's new here?", a critique might ask. "Knowledge has always been implicated in the process of economic development, since anything we do, how we transform resources into products and services, crucially depends on the knowledge we have at our disposal for effecting such transformation. An ancient artisan, a medieval craftsman and his apprentices, and a modern manufacturing system all make use of knowledge: certain skills, techniques, and procedures are employed for getting things done".

What is, then, distinctly new in the contemporary so-called "knowledge economy"? Daniel Bell answered this question more than thirty years ago: theoretical (or codified) knowledge has acquired a central place in late modern societies in a way that was not the case before. Says Bell (1999:20): "[…] Knowledge has of course been necessary in the functioning of any society. What is distinctive about the post-industrial society is the change in the character of knowledge itself. What has become decisive for the organization of decisions and the direction of change is the centrality of *theoretical knowledge* – the primacy of theory over empiricism and the codification of knowledge into abstract systems of symbols that, as in any axiomatic system, can be used to illustrate many different and varied areas of experience" (italics in the original). Indeed, it is hard today to think of an industry that does not make systematic use of "theoretical knowledge". Products increasingly incorporate more and more specialised knowledge, supplied by R&D departments, universities, and consulting firms; and production processes are also increasingly based on systematic research that aims to optimise their functioning (Drucker, 1993; Mansell and When, 1998; Stehr, 1994).

Taking a historical perspective of the development of modern market economies, as Bell does, one can clearly see the change in the character of knowledge over time. To simplify, modernity has come to mistrust intuition, preferring explicitly articulated assertions; it is uncomfortable with *ad hoc* practices, opting for systematic procedures; it substitutes detached objectivity for personal commitment (MacIntyre, 1985; Toulmin, 1990; 2001). Yet

if one takes a closer look at how theoretical (or codified) knowledge is actually *used* in practice, one will see the extent to which theoretical knowledge itself, far from being as objective, self-sustaining, and explicit as it is often taken to be, it is actually grounded on personal judgements and tacit commitments. Even the most theoretical form of knowledge, such as pure mathematics, cannot be a completely formalised system, since it is based for its application and development on the *skills* of mathematicians and how such skills are used in practice. To put it differently, codified knowledge necessarily contains a "personal coefficient" (Polanyi, 1962:17). Knowledge-based economies may indeed be making great use of codified forms of knowledge, but that kind of knowledge is inescapably used in a *non-codifiable* and *non-theoretical* manner.

The significance of "tacit knowledge" for the functioning of organizations has not escaped the attention of management theorists. Ever since Nonaka and Takeuchi (1995) have published their influential *The Knowledge-Creating Company*, it is nearly impossible to find a publication on organizational knowledge and knowledge management that does not make a reference to, or use the term "tacit knowledge". And quite rightly so: as common experience can verify, the knowledge people use in organizations is so practical and deeply familiar to them that when people are asked to describe how they do what they do, they often find it hard to express it in words (Ambrosini and Bowman, 2001; Cook and Yanow, 1996:442; Eraut, 2000; Nonaka and Takeuchi, 1995; Harper, 1987; Tsoukas and Vladimirou, 2001:987). Naturally, several questions arise: what is it about organizational knowledge that makes it so hard to describe? What is the significance of the tacit dimension of organizational knowledge? What are the implications of tacit knowledge for the learning and exercise of skills? If skilled knowing is tacit, how is it possible for new knowledge to emerge?

The purpose of this chapter is to explore the preceding questions. My argument will be that popular as the term "tacit knowledge" may have become in management studies, it has, on the whole, been misunderstood. By and large, tacit knowledge has been conceived in opposition to explicit knowledge, whereas it is simply its other side. As a result of such a misunderstanding, the nature of organizational knowledge and its relation to individual skills and social contexts has been inadequately understood. In this chapter I will first explore the nature of tacit knowledge by drawing primarily on Polanyi (the inventor of the term), an author who is frequently referred to but little understood. Then I will explore how Polanyi's understanding of tacit knowledge has been interpreted by Nonaka and Takeuchi, the two authors who, more than anyone else, have helped popularise the concept of "tacit knowledge" in management studies and whose interpretation has been adopted by most management authors (see for example, Ambrosini and Bowman, 2001; Baumard, 1999; Boisot, 1995; Davenport and Prusak, 1998; Devlin, 1999; Dixon, 2000; Leonard and Sensiper, 1998; Spender, 1996; von Krogh et al, 2000; for exceptions see, Brown and Duguid, 2000; Cook and Brown, 1999: 385 & 394-5; Kreiner, 1999; Tsoukas, 1996:14; 1997:830-831; Wenger, 1998:67). I will finally end this article by fleshing out the implications of tacit knowledge, properly understood, for an epistemology of organizational practice.

Polanyi for Beginners: A Guide

One of the most distinguishing features of Polanyi's work is his insistence on overcoming well established dichotomies such as theoretical vs. practical knowledge, sciences vs. the humanities or, to put it differently, his determination to show the common structure

underlying all kinds of knowledge. Polanyi, a chemist turned philosopher, was categorical that all knowing involves *skillful action* and that the knower necessarily participates in all acts of understanding. For him the idea that there is such a thing as "objective" knowledge, self-contained, detached, and independent of human action, was wrong and pernicious. "*All* knowing", he insists, "is personal knowing – participation through indwelling" (Polanyi and Prosch, 1975:44; italics in the original).

Take for example, the use of geographical maps. A map is a representation of a particular territory. As an explicit representation of something else, a map is, in logical terms, not different from that of a theoretical system, or a system of rules: they all aim at enabling purposeful human action, i.e. respectively, to get from A to B, to predict, and guide behaviour. We may be very familiar with a map per se but to *use* it we need to be able to relate it to the world outside the map. More specifically, to use a map we need to be able to do three things. First, we must identify our current position in the map ("you are here"). Secondly, we must find our itinerary on the map ("we want to go to the National Museum, which is there"). And thirdly, to actually go to our destination, we must identify the itinerary by various landmarks in the landscape around us ("you get past the train station and then turn left"). In other words, a map, no matter how elaborate it is, cannot read itself; it requires the judgement of a skilled reader who will relate the map to the world through both cognitive and sensual means (Polanyi and Prosch, 1975:30; Polanyi, 1962: 18-20).

The same personal judgement is involved whenever abstract representations encounter the world of experience. We are inclined to think, for example, that Newton's laws can predict the position of a planet circling round the sun, at some future point in time, provided its current position is known. Yet this is not quite the case: Newton's laws can never do that, only *we* can. The difference is crucial. The numbers entering the relevant formulae, from which we compute the future position of a planet, are readings on our instruments – they are not given, but need to be worked out. Similarly, we check the veracity of our predictions by comparing the results of our computations with the readings of the instruments – the predicted computations will rarely coincide with the readings observed and the significance of such a discrepancy needs to be worked out, again, by us (Polanyi, 1962:19; Polanyi and Prosch, 1975:30). Notice that, like in the case of map reading, the formulae of celestial mechanics cannot apply themselves; the personal judgement of a human agent is necessarily involved in applying abstract representations to the world.

The general point to be derived from the above examples is this: insofar as a formal representation has a bearing on experience, that is the extent to which a representation encounters the world, personal judgement is called upon to make an assessment of the inescapable gap between the representation and the world encountered. Given that the map is a representation of the territory, I need to be able to match my location in the territory with its representation on the map, if I am to be successful in reaching my destination. Personal judgement cannot be prescribed by rules but relies essentially on the use of our senses (Polanyi, 1962:19; 1966:20; Polanyi and Prosch, 1975:30). To the extent this happens, the exercise of personal judgement is a skilful performance, involving both the mind and the body.

The crucial role of the body in the act of knowing has been persistently underscored by Polanyi (cf. Gill, 2000:44-50). As said earlier, the cognitive tools we use do not apply themselves; we apply them and, thus, we need to assess the extent to which our tools match aspects of the world. Insofar as our contact with the world necessarily involves our somatic

equipment – "the trained delicacy of eye, ear, and touch" (Polanyi and Prosch, 1975:31)- we are engaged in the art of establishing a correspondence between the explicit formulations of our formal representations (be they maps, scientific laws or organizational rules) and the actual experience of our senses. As Polanyi (1969:147) remarks, "the way the body participates in the act of perception can be generalized further to include the bodily roots of all knowledge and thought. […] Parts of our body serve as tools for observing objects outside and for manipulating them".

If we accept that there is indeed a "personal coefficient" (Polanyi, 1962:17) in all acts of knowing, which is manifested in a skilful performance carried out by the knower, what is the structure of such a skill? What is it that enables a map-reader to make a competent use of the map to find his/her way around, a scientist to use the formulae of celestial mechanics to predict the next eclipse of the moon, and a physician to read an X-ray picture of a chest? For Polanyi the starting point towards answering this question is to acknowledge that "the aim of a skilful performance is achieved by the observance of a set of rules which are not known as such to the person following them" (Polanyi, 1962:49). A cyclist, for example, does not normally know the rule that keeps her balance, nor does a swimmer know what keeps him afloat. Interestingly, such ignorance is hardly detrimental to their effective carrying out of their respective tasks.

The cyclist keeps herself in balance by winding through a series of curvatures. One can formulate the rule explaining why she does not fall off the bicycle - "for a given angle of unbalance the curvature of each winding is inversely proportional to the square of the speed at which the cyclist is proceeding" (Polanyi, 1962:50) – but such a rule would hardly be helpful to the cyclist. Why? Partly because, as we will see below, no rule is helpful in guiding action unless it is assimilated and lapses into unconsciousness. And partly because there is a host of other particular elements to be taken into account, which are not included in this rule and, crucially, are not known by the cyclist. Skills retain an element of opacity and unspecificity; they cannot be fully accounted for in terms of their particulars, since their practitioners do not ordinarily know what those particulars are; even when they do know them, as for example in the case of topographic anatomy, they do not know how to integrate them (Polanyi, 1962: 88-90). It is one thing to learn a list of bones, arteries, nerves and viscara and quite another to know how precisely they are intertwined inside the body (*op.cit*., p.89)

How then do individuals know how to exercise their skills? In a sense they don't. "A mental effort", says Polanyi (1962:62), "has a heuristic effect: it tends to incorporate any available elements of the situation which are helpful for its purpose". Any particular elements of the situation which may help the purpose of a mental effort are selected insofar as they contribute to the performance at hand, without the performer knowing them as they would appear in themselves. The particulars are subsidiarily known insofar as they contribute to the action performed. As Polanyi (1962:62) remarks, "this is the usual process of unconscious trial and error by which *we feel our way* to success and may continue to improve on our success without specifiably knowing how we do it – for we never meet the causes of our success as identifiable things which can be described in terms of classes of which such things are members. This is how you invent a method of swimming without knowing that it consists in regulating your breath in a particular manner, or discover the principle of cycling without realizing that it consists in the adjustment of your momentary direction and velocity,

so as to counteract continuously your momentary accidental unbalance" (italics in the original).

There are two different kinds of awareness in exercising a skill. When I use a hammer to drive a nail (one of Polanyi's favourite examples – see Polanyi, 1962:55; Polanyi and Prosch, 1975:33), I am aware of both the nail and the hammer but in a different way. I watch the effects of my strokes on the nail, and try to hit it as effectively as I can. Driving the nail down is the main object of my attention and I am focally aware of it. At the same time, I m also aware of the feelings in my palm of holding the hammer. But such awareness is subsidiary: the feelings of holding the hammer in my palm are not an object of my attention but an instrument of it. I watch hitting the nail by being aware of them. As Polanyi and Prosch (1975:33) remark: "I know the feelings in the palm of my hand *by relying on them for attending to the hammer hitting the nail*. I may say that I have a *subsidiary* awareness of the feelings in my hand which is merged into my *focal awareness* of my driving the nail" (italics in the original).

If the above is accepted, it means that we can be aware of certain things in a way that is quite different from focussing our attention to them. I have a subsidiary awareness of my holding the hammer in the act of focussing on hitting the nail. In being subsisiarily aware of holding a hammer I see it as having a meaning that is wiped out if I focus my attention on how I hold the hammer. Subsidiary awareness and focal awareness are mutually exclusive (Polanyi, 1962:56). If we switch our focal attention to particulars of which we had only subsidiary awareness before, their meaning is lost and the corresponding action becomes clumsy. If a pianist shifts her attention from the piece she is playing to how she moves her fingers; if a speaker focusses his attention to the grammar he is using instead of the act of speaking; or if a carpenter shifts his attention from hitting the nail to holding the hammer, they will all be confused. We must rely (to be precise, we must learn to rely) subsidiarily on particulars for attending to something else, hence our knowledge of them remains *tacit* (Polanyi, 1966:10; Winograd and Flores, 1987:32). In the context of carrying out a specific task, we come to know a set of particulars without being able to identify them. In Polanyi's (1966:4) memorable phrase, "we can know more than we can tell".

From the above it follows that tacit knowledge forms a triangle, at the three corners of which are the *subsidiary particulars*, the *focal target*, and the *knower* who links the two. It should be clear from the above that the linking of the particulars to the focal target does not happen automatically but is a result of the *act* of the knower. It is in this sense that Polanyi talks about all knowledge being *personal* and all knowing being *action*. No knowledge is possible without the integration of the subsidiaries to the focal target by a person. However, unlike explicit inference, such integration is essentially tacit and irreversible. Its tacitness was earlier discussed; its irreversible character can be seen if juxtaposed to explicit (deductive) inference, whereby one can unproblematically traverse between the premises and the conclusions. Such traversing is not possible with tacit integration: once you have learned to play the piano you cannot go back to being ignorant of how to do it. While you can certainly focus your attention on how you move your fingers, thus making your performance clumsy to the point of paralyzing it, you can always recover your ability by casting your mind forward to the music itself. With explicit inference, no such break-up and recovery are possible (Polanyi and Prosch, 1975:39-42). When, for example, you examine a legal syllogism or a mathematical proof you proceed orderly from the premises, or a sequence of logical steps, to the conclusions. You lose nothing and you recover nothing – there is complete

reversibility. You can go back to check the veracity of each constituent statement separately and how it logically links with its adjacent statements. Such reversibility is not, however, possible with tacit integration. Shifting attention to subsidiary particulars entails the loss of the skillful engagement with the activity at hand. By focussing on a subsidiary constituent of skilful action one changes the character of the activity one is involved with. There is no reversibility in this instance.

The structure of tacit knowing has three aspects: the functional, the phenomenal and the semantic. The functional aspect consists in the *from-to* relation of particulars (or subsidiaries) to the focal target. Tacit knowing is a from-to knowing: we know the particulars by relying on our awareness of them for attending to something else. Human awareness has a "vectorial" character (Polanyi, 1969:182): it moves from subsidiary particulars to the focal target (cf. Gill, 2000:38-39). Or, in the words of Polanyi and Prosch (1975:37-8), "subsidiaries exist as such by bearing on the focus *to* which we are attending *from* them" (italics in the original). The phenomenal aspect involves the transformation of subsidiary experience into a new sensory experience. The latter appears through – it is created out of - the tacit integration of subsidiary sense perceptions. Finally, the semantic aspect is the meaning of subsidiaries, which is the focal target on which they bear.

The above aspects of tacit knowing will become clearer with an example. Imagine a dentist exploring a tooth cavity with a probe. Her exploration is a from-to knowing (the functional aspect): she relies subsidiarily on her feeling of holding the probe in order to attend focally to the tip of the probe exploring the cavity. In doing so the sensation of the probe pressing on her fingers is lost and, instead, she feels the point of the probe as it touches the cavity. This is the phenomenal aspect whereby a new coherent sensory quality appears (i.e. her sense of the cavity) from the initial sense perceptions (i.e. the impact of the probe on the fingers). Finally, the probing has a semantic aspect: the dentist gets information by using the probe. That information is the meaning of her tactile experiences with the probe. As Polanyi (1966:13) argues, the dentist becomes aware of the feelings in her hand in terms of their meaning located at the tip of the probe, to which she is attending.

We engage in tacit knowing through virtually anything we do: we are normally unaware of the movement of our eye muscles when we observe, of the rules of language when we speak, of our bodily functions as we move around. Indeed, to a large extent, our daily life consists of a huge number of small details of which we tend to be focally unaware. When, however, we engage in more complex tasks, requiring even a modicum of specialised knowledge, then we face the challenge of how to assimilate the new knowledge – to interiorise it, dwell in it - in order to get things done efficiently and effectively. Polanyi gives the example of a medical student attending a course in X-ray diagnosis of pulmonary diseases. The student is initially puzzled: "he can see in the X-ray picture of a chest only the shadows of the heart and the ribs, with a few spidery blotches between them. The experts seem to be romancing about figments of their imagination; he can see nothing that they are talking about" (Polanyi, 1962: 101).

At the early stage of his training the student has not assimilated the relevant knowledge; unlike the dentist with the probe, he cannot yet use it as a tool to carry out a diagnosis. The student, at this stage, is a remove from the diagnostic task as such: he cannot think about it directly; he rather needs to think about the relevant radiological knowledge first. If he perseveres with his training, however, "he will gradually forget about the ribs and begin to see the lungs. And eventually, if he perseveres intelligently, a rich panorama of

significant details will be revealed to him: of physiological variations and pathological changes, of scars, of chronic infections and signs of acute disease. He has entered a new world" (Polanyi, 1962:101).

We see here an excellent illustration of the structure of tacit knowledge. The student has now interiorised the new radiological knowledge; the latter has become tacit knowledge, of which he is subsidiarily aware while attending to the X-ray itself. Radiological knowledge exists now not as something unfamiliar which needs to be learned and assimilated before a diagnosis can take place, but as a set of particulars – subsidiaries – which exist as such by bearing on the X-ray (the focus) *to* which the student is attending *from* them. Insofar as this happens, a phenomenal transformation has taken place: the heart, the ribs and the spidery blotches gradually disappear and, instead, a new sensory experience appears – the X-ray is no longer a collection of fragmented radiological images of bodily organs, but a representation of a chest full of meaningful connections. Thus, as well as having functional and phenomenal aspects, tacit knowledge has a semantic aspect: the X-ray conveys information to an appropriately skilled observer. The meaning of the radiological knowledge, subsidiarily known and drawn upon by the student, is the diagnostic information he receives from the X-ray: it tells him what it is that he is observing by using that knowledge.

It should be clear from the above that for Polanyi, from a gnosiological point of view, there is no difference whatsoever between tangible things like probes, sticks, or hammers on the one hand, and intangible constructions such as radiological, linguistic, or cultural knowledge on the other – they are all *tools* enabling a skilled user to get things done. To use a tool properly we need to assimilate it and dwell in it. In Polanyi's (1969:148) words, "we may say that when we learn to use language, or a probe, or a tool, and thus make ourselves aware of these things as we are our body, we *interiorize* these things and *make ourselves dwell in them*" (italics in the original). The notion of *indwelling* is crucial for Polanyi and turns up several times in his writings. It is only when we dwell in the tools we use, make them extensions of our own body, that we amplify the powers of our body and shift outwards the points at which we make contact with the world outside (Polanyi, 1962:59; 1969:148; Polanyi and Prosch, 1975:37). Otherwise our use of tools will be clumsy and will get in the way of getting things done.

For a tool to be unproblematically used it must not be the object of our focal awareness; it rather needs to become an instrument through which we act - of which we are subsidiarily aware – not an object of attention. To dwell in a tool implies that one *uncritically* accepts it, is unconsciously committed to it. Such uncritical commitment is a necessary pre-supposition for using the tool effectively and, as such, cannot be asserted. Presuppositions cannot be asserted, says Polanyi (1962:60), "for assertion[s] can be made only *within* a framework with which we have identified ourselves for the time being; as they are themselves our ultimate framework, they are essentially inarticulable" (italics in the original).

The interiorisation of a tool – its instrumentalisation in the service of a purpose – is beneficial to its user for it enables him/her to acquire new experiences and carry out more competently the task at hand (Dreyfus and Dreyfus, 2000). Compare, for example, one who learns driving a car to one who is an accomplished driver. The former may have learned how to change gear and to use the break and the accelerator but cannot, yet, integrate those individual skills – he has not constructed a coherent perception of driving, the phenomeal transformation has not taken place yet. At the early stage, the driver is conscious of what he needs to do and feels the impact of the pedals on his foot and the gear stick on his palm; he

has not learned to unconsciously correlate the performance of the car with the specific bodily actions he undertakes as a driver. The experienced driver, by contrast, is unconscious of the actions by which she drives – car instruments are tools whose use she has mastered, that is interiorised, and is therefore able to use them for the purpose of driving. By becoming unconscious of certain actions, the experienced driver expands the domain of experiences she can concentrate on as a driver (i.e. principally road conditions and other drivers' behaviour).

The more general point to be derived from the preceding examples is formulated by Polanyi (1962:61) as follows: "we may say […] that by the effort by which I concentrate on my chosen plane of operation I succeed in absorbing all the elements of the situation of which I might otherwise be aware in themselves, so that I become aware of them now in terms of the operational results achieved through their use". This is important because we get things done, we achieve competence, by becoming unaware of how we do so. Of course one can take an interest in, and learn a great deal about, the gearbox and the acceleration mechanism but, to be able to drive, such knowledge needs to lapse into unconsciousness. "This lapse into unconsciousness", remarks Polanyi (1962:62), "is accompanied by a newly acquired consciousness of the experiences in question, on the operational plane. It is misleading, therefore, to describe this as the mere result of repetition; it is a structural change achieved by a repeated mental effort aiming at the instrumentalization of certain things and actions in the service of some purpose".

Notice that, for Polanyi, the shrinking of consciousness of certain things is, in the context of action, necessarily connected with the expansion of consciousness of other things. Particulars such as "changing gear" and "pressing the accelerator" are subsidiarily known, as the driver concentrates on the act of driving. Knowing something, then, is always a contextual issue and fundamentally connected to action (the "operational plane"). My knowledge of gears is in the context of driving, and it is only in such a context that I am subsidiarily aware of that knowledge. If, however, I was a car mechanic, gears would constitute my focus of attention, rather than being an assimilated particular. Knowledge has, therefore, a *recursive* form: given a certain context, we blackbox – assimilate, interiorise, instrumentalise – certain things in order to concentrate – focus - on others. In another context, and at another level of analysis (cf. Bateson, 1979:43), we can open up some of the previously blackboxed issues and focus our attention to them. In theory this is an endless process, although in practice there are institutional and practical limits to it. In this way we can, to some extent, 'vertically integrate' our knowledge, although, as said earlier, what pieces of knowledge we *use* depends, at any point in time, on context. If the driver happens to be a car mechanic as well as an engineer he will have acquired three different bodies of knowledge, each having a different degree of abstraction, which, taken together, give his knowledge depth and make him a sophisticated driver (cf. Harper, 1987:33). How, however, he draws on each one of them – that is, what is focally and what is subsidiarily known - depends on the context-in-use. Moreover, each one of these bodies of knowledge stands on its own, and cannot be reduced to any of the others. The practical knowledge I have of my car cannot be replaced by the theoretical knowledge of an engineer; the practical knowledge I have of my own body cannot be replaced by the theoretical knowledge of a physician (cf. Polanyi, 1966:20). In the social world, specialist, abstract, theoretical knowledge is necessarily refracted through the "lifeworld" – the taken-for-granted assumptions by means of which human beings organize their experience, knowledge, and transactions with the world (cf. Bruner, 1990:35).

The appropriation of "tacit knowledge" in management studies: The great misunderstanding

As was mentioned in the introductory section of this paper, "tacit knowledge" has become very popular in management studies since the middle 1990s, to a large extent, due to the publication of Nonaka and Takeuchi's (1995) *The Knowledge-Creating Company*. The cornerstone of Nonaka and Takeuchi's theory for organizational knowledge is the notion of "knowledge conversion" – how tacit knowledge is "converted" to explicit knowledge, and vice versa. As the authors argue, "our dynamic model of knowledge creation is anchored to a critical assumption that human knowledge is created and expanded through social interaction between tacit knowledge and explicit knowledge. We shall call this interaction "knowledge conversion"" (Nonaka and Takeuchi, 1995:61).

Nonaka and Takeuchi distinguish four modes of knowledge conversion: from tacit knowledge to tacit knowledge (socialization); from tacit knowledge to explicit knowledge (externalization); from explicit knowledge to explicit knowledge (combination); and from explicit knowledge to tacit knowledge (internalization). Tacit knowledge is converted to tacit knowledge through observation, imitation and practice, in those cases where an apprentice learns from a master. Tacit knowledge is converted to explicit knowledge when it is articulated and it takes the form of concepts, models, hypotheses, metaphors, and analogies. Explicit knowledge is converted to explicit knowledge when different bodies of explicit knowledge are combined. And explicit knowledge is converted into tacit knowledge when it is first verbalised and then absorbed, internalised by the individuals involved.

The organizational knowledge-creation process proceeds in cycles (in a spiral-like fashion), with each cycle consisting of five phases: the sharing of tacit knowledge among the members of a team; the creation of concepts whereby a team articulates its commonly shared mental model; the justification of concepts in terms of the overall organizational purposes and objectives; the building of an archetype which is a tangible manifestation of the justified concept; and the cross-leveling of knowledge, whereby a new cycle of knowledge creation may be created elsewhere (or even outside of) the organization.

To illustrate their theory, Nonaka and Takeuchi describe the product development process of Matsushita's Home Bakery, the first fully automated bread-making machine for home use, which was introduced to the Japanese market in 1987. There were three cycles in the relevant knowledge-creation process, with each cycle starting in order to either remove the weaknesses of the previous one or improve upon its outcome. The first cycle ended with the assemblage of a prototype which, however, was not up to the design team's standards regarding the quality of bread it produced. This triggered the second cycle which started when Ikuko Tanaka, a software developer, took an apprenticeship with a master baker at the Osaka International Hotel. Her purpose was to learn how to knead bread dough properly in order to "convert" later this know-how into particular design features of the bread-making machine under development. Following this, the third cycle came into operation whereby the commercialization team, consisting of people drawn from the manufacturing and marketing sections, further improved the prototype that came out of the second cycle, and made it a commercially viable product.

To obtain a better insight into what Nonaka and Takeuchi mean by "tacit knowledge" and how it is related to "explicit knowledge", it is worth zooming into their

description of the second cycle of the knowledge-creation process, since this is the cycle most relevant to the acquisition and "conversion" of tacit knowledge. In the section below I quote in full the authors' description of this cycle (references and figures have been omitted) (see Nonaka and Takeuchi: 1995:103-106).

A Case Study: The Second Cycle of the Home Bakery Spiral

"The second cycle began with a software developer, Ikuko Tanaka, sharing the tacit knowledge of a master baker in order to learn his kneading skill. A master baker learns the art of kneading, a critical step in bread making, following years of experience. However, such expertise is difficult to articulate in words. To capture this tacit knowledge, which usually takes a lot of imitation and practice to master, Tanaka proposed a creative solution. Why not train with the head baker at Osaka International Hotel, which had a reputation for making the best bread in Osaka, to study the kneading techniques? Tanaka learned her kneading skills through observation, imitation, and practice. She recalled:

> At first, everything was a surprise. After repeated failures, I began to ask where the master and I differed. I don't think one can understand or learn this skill without actually doing it. His bread and mine [came out] quite different even though we used the same materials. I asked why our products were so different and tried to reflect the difference in our skill of kneading.

"Even at this stage, neither the head baker nor Tanaka was able to articulate knowledge in any systematic fashion. Because their tacit knowledge never became explicit, others within Matsushita were left puzzled. Consequently, engineers were also brought to the hotel and allowed to knead and bake bread to improve their understanding of the process. Sano, the division chief, noted, "If the craftsmen cannot explain their skills, then the engineers should become craftsmen."

"Not being an engineer, Tanaka could not devise mechanical specifications. However, she was able to transfer her knowledge to the engineers by using the phrase "twisting stretch" to provide a rough image of kneading, and by suggesting the strength and speed of the propeller to be used in kneading. She would simply say, "Make the propeller move stronger", or "Move it faster". Then the engineers would adjust the machine specifications. Such a trial-and-error process continued for several months.

"Her request for a "twisting stretch" movement was interpreted by the engineers and resulted in the addition inside the case of special ribs that held back the dough when the propeller turned so that the dough could be stretched. After a year of trial and error and working closely with other engineers, the team came up with product specifications that successfully reproduced the head baker's stretching technique and the quality of bread Tanaka had learned to make at the hotel. The team then materialized this concept, putting it together into a manual, and embodied it in the product. […]

"In the second cycle, the team had to resolve the problem of getting the machine to knead dough correctly. To solve the kneading problem, Ikuko Tanaka apprenticed herself with the head baker of the Osaka International Hotel. There she learned the skill through *socialization,* observing and imitating the head baker, rather than through reading memos or manuals. She then translated the kneading skill into explicit knowledge. The knowledge was *externalized* by *creating the concept of "twisting stretch"*. In addition, she *externalized* this knowledge

by expressing the movements required for the kneading propeller, using phrases like "more slowly" or "more strongly". For those who had never touched dough before, understanding the kneading skill was so difficult that engineers had to *share experiences* by spending hours at the baker to experience the touch of the dough. Tacit knowledge was *externalized* by lining special ribs inside the dough case. *Combination* took place when the "twisting stretch" concept and the technological knowledge of the engineers came together to produce a prototype of Home Bakery. Once the prototype was *justified* against the concept of "Rich," the development moved into the third cycle." (italics in the original; Nonaka and Takeuchi, 1995:103-106)

How should we understand tacit knowledge?

The preceding account of tacit knowledge has very little in common with that of Polanyi. Nonaka and Takeuchi assume that tacit knowledge is knowledge-not-yet-articulated: a set of rules incorporated in the activity an actor is involved, which is a matter of time for him/her to first learn and then formulate. The authors seem to think that what Tanaka learned through her apprenticeship with the master baker can be ultimately crystallized in a set of propositional 'if-then' statements (Tsoukas, 1998:44-48), or what Oakeshott (1991:12-15) calls "technical knowledge" and Ryle (1963:28-32) "knowing that". In that sense, the tacit knowledge involved in kneading that Tanaka picked up through her apprenticeship – in Oakeshott's (1991:12-15) terms, the "practical knowledge" of kneading, and in Ryle's (1963:28-32) terms, "knowing how" to knead -, the sort of knowledge that exists only *in use* and cannot be formulated in rules, is equivalent to the set of statements that articulate it, namely it is equivalent to technical knowledge.

Tacit knowledge is thought to have the structure of a syllogism and as such can be reversed and, therefore, even mechanized (cf. Polanyi and Prosch, 1975:40). What Tanaka was missing, the authors imply, were the premises of the syllogism, which she acquired through her sustained apprenticeship. Once they have been learned, it was a matter of time before she could put them together and arrive at the conclusion that "twisting stretch" and "the [right] movements required for the kneading propeller" (Nonaka and Takeuchi, 1995:103-106) were what was required for designing the right bread-making machine.

However, although Nonaka and Takeuchi acknowledge that Tanaka's apprenticeship was necessary because "the art of kneading" (Nonaka and Takeuchi, 1995:103) could not be imparted in any other way (e.g. "through reading memos and manuals", *op.cit.*, p.105), they view her apprenticeship as merely an alternative mechanism of transferring knowledge. In terms of content, knowledge acquired through apprenticeship is not thought to be qualitatively different from knowledge acquired through reading manuals, since in both cases the content of knowledge can be articulated and formulated in rules – only the manner of its appropriation differs. The mechanism of knowledge acquisition may be different, but the result is the same.

The "conduit metaphor of communication" (Lakoff, 1995:116; Reddy, 1979; Tsoukas, 1997) that underlies Nonaka and Takeuchi's perspective – the view of ideas as objects which can be extracted from people and transmitted to others over a conduit – reduces practical knowledge to technical knowledge (cf. Costelloe, 1998:325-326). However, while clearly Tanaka learned a technique during her apprenticeship, she acquired much more than technical knowledge, without even realising it: she learned to make bread in a way

which cannot be formulated in propositions but only manifested in her work. To treat practical (or tacit) knowledge as having a precisely definable content, which is initially located in the head of the practitioner and then "translated" (Nonaka and Takeuchi, 1995:105) into explicit knowledge, is to reduce what is known to what is articulable, thus impoverishing the notion of practical knowledge. As Oakeshott (1991:15) remarks, "a pianist acquires artistry as well as technique, a chess-player style and insight into the game as well as a knowledge of the moves, and a scientist acquires (among other things) the sort of judgement which tells him when his technique is leading him astray and the connoisseurship which enables him to distinguish the profitable from the unprofitable directions to explore".

As should be clear from the preceding section, by viewing all knowing as essentially "personal knowing" (Polanyi, 1962:49), Polanyi highlights the skilled performance that all acts of knowing require: the actor does not know all the rules he/she follows in the activity he/she is involved. Like Oakeshott (1991), Polanyi (1962:50) notes that "rules of art can be useful, but they do not determine the practice of an art; they are maxims, which can serve as a guide to an art only if they can be integrated into the practical knowledge of the art. They cannot replace that knowledge". It is precisely because what needs to be known cannot be specified in detail that the relevant knowledge must be passed from master to apprentice. "To learn by example", says Polanyi (1962:53), "is to submit to authority. You follow your master because you trust his manner of doing things even when you cannot analyse and account in detail for its effectiveness. By watching the master and emulating his efforts in the presence of his example, the apprentice unconsciously picks up the rules of the art, including those which are not explicitly known to the master himself. These hidden rules can be assimilated only by a person who surrenders himself to that extent uncritically to the imitation of another".

Like Polanyi's medical student discussed earlier, Tanaka was initially puzzled by what the master baker was doing – "at first, everything was a surprise" (Nonaka and Takeuchi, 1995:104), as she put it. Her "repeated failures" (*op.cit.*, p.104) were due not to lack of knowledge as such, but due to not having interiorised – dwelled in – the relevant knowledge yet. When, through practice, she begun to assimilate the knowledge involved in kneading bread – namely, when she became subsidiarily aware of how she was kneading - she could, subsequently, turn her focal awareness to the task at had: *kneading* bread, as opposed to imitating the master. Knowledge now became a tool to be tacitly known and uncritically used in the service of an objective. 'Kneading bread' ceased to be an object of focal awareness and became an instrument for actually kneading bread – a subsidiarily known tool for getting things done (Winograd and Flores, 1987:27-37). For Tanaka to "convert" her kneading skill into explicit knowledge, she would need to focus her attention on her subsidiary knowledge, thereby becoming focally aware of it. In that event, however, she would no longer be engaged in the same activity, namely bread kneading, but in the activity of thinking about bread kneading, which is a different matter. The particulars of her skill are "logically unspecifiable" (Polanyi, 1962:56), in the sense that their specification would logically contradict and practically paralyse what is implied in the carrying out of the performance at hand.

Of course, one might acknowledge this and still insist, along with Ambrosini and Bowman (2001) and Eraut (2000), that Tanaka could, *ex post facto*, reflect on her kneading skill, in the context of discussing bread-kneading with her colleagues – the engineers -, and articulate it into explicit knowledge. But this would be an erroneous claim to make for, in

such an event, she would no longer be describing her kneading skill *in toto* but only its technical part: that which is possible to articulate in rules, principles, maxims - in short, in propositions. What she has to say about the "ineffable" (Polanyi, 1962: 87-95) part of her skill, that which is tacitly known, she has said already in the bread she kneads and cannot put it in words (cf. Oakeshott, 1991:14; Janik, 1992:37). As Polanyi so perceptively argued, you cannot view subsidiary particulars as they allegedly are in themselves for they exist always in conjunction with the focus to which you attend from them, and that makes them unspecifiable. In his words: "Subsidiary or instrumental knowledge, as I have defined it, is not known in itself but is known in terms of something focally known, to the quality of which it contributes; and to this extent it is unspecifiable. Analysis may bring subsidiary knowledge into focus and formulate it as a maxim or as a feature in a physiognomy, but such specification is in general not exhaustive. Although the expert diagnostician, taxonomist and cotton-classer can indicate their clues and formulate their maxims, they know many more things than they can tell, knowing them only in practice, as instrumental particulars, and not explicitly, as objects. The knowledge of such particulars is therefore ineffable, and the pondering of a judgement in terms of such particulars is an ineffable process of thought" (Polanyi, 1962:88).

If the above is accepted, it follows that Tanaka neither "transferred" her tacit knowledge to the engineers, nor did she "convert" her kneading skill into explicit knowledge, as Nonaka and Takeuchi (1995:104&105) suggest. She could do neither of these things simply because, following Polanyi's and Oakeshott's definitions of tacit and practical knowledge respectively, skillful knowing contains an ineffable element; it is based on an act of personal insight that is essentially inarticulable.

Well, so far so good, but how are we to interpret Tanaka's concept of "twisting stretch", which turned out to be so useful for the making of Matsushita's bread-making machine? Or, to put it more generally, does the ineffability of skilful knowing imply that we can never talk about a practical activity at all? That the skills involved in, say, carpentry, teaching, ship navigation, or scientific activity will ultimately be mystical experiences outside the realm of reasoned discussion?

Not at all. What we do when we reflect on the practical activities we engage in, is to re-punctuate the distinctions underlying those activities, to draw the attention of those involved to certain hitherto unnoticed aspects of those activities - to see connections among items previously thought unconnected (cf. Weick, 1995: 87&126). Through instructive forms of talk (e.g. "look at this", "have you thought about this in that way?", "try this", "imagine this", "compare this to that") practitioners are moved to *re*-view the situation they are in, to relate to their circumstances in a different way. From a Wittgensteinian perspective, Shotter and Katz (1996:230) summarize succintly this process as follows: "to gain an explicit understanding of our everyday, practical activities, we can make use of the very same methods we used in gaining that practical kind of understanding in the first place – that is, we can use the self-same methods for drawing *our* attention to how people draw each other's attention to things, as they themselves (we all?) in fact use!".

Notice what Shotter and Katz are saying: we learn to engage in practical activities through our participation in social practices, under the guidance of people who are more experienced than us (MacIntyre, 1985: 181-203; Taylor, 1993); people who, by drawing our attention to certain things, make us "see connections" (Wittgenstein, 1953: No.122), pretty much like the master baker was drawing Tanaka'a attention to certain aspects of bread-

kneading. Through her subsequent conversations with the engineers, Tanaka was able to form an explicit understanding of the activity she was involved in, by having her attention drawn to how the master baker was drawing her attention to kneading – hence the concept of "twisting stretch". It is in this sense that Wittgenstein talks of language as issuing reminders of things we *already* know: "Something that we know when no one asks us, but no longer know when we are supposed to give an account of it, is something that we need to *remind* ourselves of" (Wittgenstein, 1953: No.89; italics in the original).

In her apprenticeship, Tanaka came eventually to practice "twisting stretch" but she did not know it. She needed to be "reminded" of it. When we recursively punctuate our understanding, we see new connections and "[give] prominence to distinctions which our ordinary forms of language easily makes us overlook" (*op.cit*., No.132). Through the instructive (or directive) use of language we are led to notice certain aspects of our circumstances that, due to their simplicity and familiarity, they remain hidden ("one is unable to notice something – because it is always before one's eyes" (Wittgenstein, 1953: No.129). This is, then, the sense in which although skilful knowing is ultimately ineffable, it nonetheless can be talked about: through reminding ourselves of it, we notice certain important features which had hitherto escaped our attention and can now be seen in a new context. Consequently, we are led to relate to our circumstances in new ways and thus see new ways forward.

Conclusions

Tacit knowledge has been greatly misunderstood in management studies – or so I have argued in this paper. Nonaka and Takeuchi's interpretation of tacit knowledge as knowledge-not-yet-articulated – knowledge awaiting for its "translation" or "conversion" into explicit knowledge –, an interpretation that has been widely adopted in management studies, is erroneous: it ignores the essential ineffability of tacit knowledge, thus reducing it to what can be articulated. Tacit and explicit knowledge are not the two ends of a continuum but the two sides of the same coin: even the most explicit kind of knowledge is underlain by tacit knowledge. Tacit knowledge consists of a set of particulars of which we are subsidiarily aware as we focus on something else. Tacit knowing is vectorial: we know the particulars by relying on our awareness of them for attending to something else. Since subsidiaries exist as such by bearing on the focus *to* which we are attending *from* them, they cannot be separated from the focus and examined independently, for if this is done, their meaning will be lost. While we can certainly focus on particulars, we cannot do so in the context of action in which we are subsidiarily aware of them. Moreover, by focussing on particulars after a particular action has been performed, we are *not* focussing on them as they bear on the original focus of action, for their meaning is necessarily derived from their connection to that focus. When we focus on particulars we do so in a new context of action which itself is underlain by a new set of subsidiary particulars. Thus the idea that somehow one can focus on a set of particulars and convert them into explicit knowledge is unsustainable.

The ineffability of tacit knowledge does not mean that we cannot discuss the skilled performances in which we are involved. We can – indeed, should - discuss them provided we stop insisting on "converting" tacit knowledge and, instead, start recursively drawing our attention to how we draw each other's attention to things. Instructive forms of talk help us re-orientate ourselves to how we relate to others and the world around us, thus enabling us

to talk and act differently. We can command a clearer view of our tasks at hand if we "re-mind" ourselves of how we do things so that distinctions which we had previously not noticed, and features which had previously escaped our attention, may be brought forward. Contrary to what Ambrosini and Bowman (2001) suggest, we do not so much need to operationalise tacit knowledge (as explained earlier, we could not do this, even if we wanted) as to find new ways of talking, fresh forms of interacting, and novel ways of distinguishing and connecting. Tacit knowledge cannot be "captured", "translated", or "converted" but only displayed, manifested, in what we do. New knowledge comes about not when the tacit becomes explicit, but when our skilled performance – our praxis - is punctuated in new ways through social interaction (Tsoukas, 2001).

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