

DIVING UNDER THE SURFACE OF TACIT KNOWLEDGE

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Abstract

The number of writings on tacit knowledge is increasing and as the nature of the concept is difficult to verbalize, this has resulted in different definitions and concepts used on tacit knowing. Epitomes of tacit knowledge (ETK) are concepts used to facilitate the understanding of tacit knowing. In this paper the definitions of tacit knowledge are viewed as scholars explicit knowledge and the ETK as the tacit knowing they possess of the concept tacit knowledge. The use of ETK in scientific literature is more random than bounded on conceptual basis and this obstructs the work with tacit knowledge within and outside academia.

The aim of this paper is to clarify the use of concepts of tacit knowledge in the academic literature on the topic. The analysis results in a proposal for an extended perspective on tacit knowing. This proposal has affect on both tacit knowledge research and management.

Keywords: Knowledge, Knowledge Management, Tacit Knowledge, Concepts of Knowledge.

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Suggested track: B Epistemology of knowledge

1. Introduction

This paper addresses how the metaphor of “the iceberg” (Baumard 1999) is applicable not only on the explicit/visible and tacit/hidden knowledge resources but also on the concept of tacit knowledge in the tradition of Michael Polanyi. It focuses upon the use of the concept tacit knowledge in the writings of scholars on the topic. As research on knowledge has had a huge

increase in the last decade the number of studies and literature on the topic has increased. The increased interest is due to business capabilities related to learning (the learning organization, organizational learning) and knowledge (Knowledge Management, Intellectual Capital). Current literature on knowledge, both managerial and academic, emphasizes the importance of tacit knowing not only as a form of competitive advantage (Birchall and Tovstiga 1999) and as strategy (Johannessen, Olaisen and Olsen 2001) but also as related to learning (Lam 2000), innovation (Lam 2000) and product development (Kreiner 2002). As further perspectives are addressed the topic of tacit knowledge will continue to raise interest. A main characteristic of tacit knowing is difficulty to verbalize and this has led to a variety of concepts, or epitomes, used as elucidatory examples of the intangible tacit knowing. The epitomes cannot be apprehended as synonyms to tacit knowledge as there can be different meanings in them in addition to the tacit knowing. They are rather to be seen as indicators of tacit knowing being used as they stand as symbols of tacit knowledge. Concepts like these are working tools for researchers as well as means for us all to understand the ambiguous tacitness of knowledge. Epitomes of tacit knowledge (ETK) like *Intuition*, *Know-How*, *Rule-of-Thumb* and *Gut Feeling*, are widely used but they are often used without thought of the range of meaning in them. In this variety of epitomes there is a risk of misunderstandings and misuse of the concept tacit knowledge and by recognizing the epitomes we may turn this risk to a valuable resource, a resource of tools to be used by both scholars and business people.

The ETK can also be seen as extended forms of knowledge on tacit knowing. We can see the used definitions of tacit knowledge as the scholar's explicit knowing on tacit knowledge and the use of ETK as their tacit knowing on tacit knowledge. Doing that we can attain a more holistic view of the concept of tacit knowledge, see the whole iceberg. To do this texts of scholars on tacit knowledge have been read and analyzed as these are the products of those who can be regarded as experts on the concept of tacit knowledge. As experts they hold a considerable amount of tacit knowing on their area of expertise (Lawson and Lorenzi 1999)

The aim of this paper is therefore to clarify the use of the concept tacit knowledge in the academic literature on tacit knowing. The study consists of books and articles on knowledge and tacit knowledge written 1956 – 2002. The text analysis focuses on how definitions of tacit knowledge as well as concepts used to further explain tacit knowing (ETK) are used as knowledge of tacit knowledge. The method used is inspired by Polanyis "change of focus"

between focal and subsidiary awareness. (Polanyi 1958) The result is a discussion on whether the definitions of tacit knowledge in use are in fact only the top of the iceberg of tacit knowing.

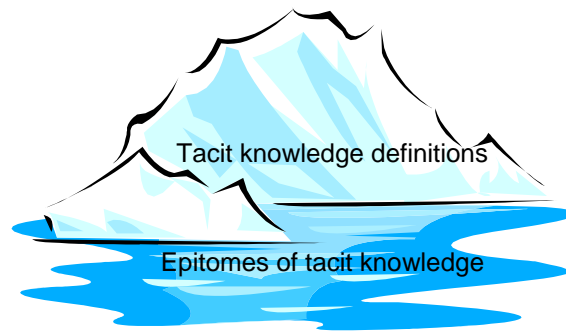


Fig. 1. The iceberg of tacit knowledge

2. Explicit knowledge of tacit knowing – definitions of the concept of tacit knowledge

It is hard to estimate knowledge but it is rather like a spectrum where one extreme is seen as completely tacit and implicit knowledge and the other as completely explicit and codified knowledge (Leonard and Sensiper 1998; Augier and Vendelo 1999).

Knowledge resources have pertinently been described as an iceberg (Ancori, Bureth and Cohendet 2000). The structured, explicit knowledge is the visible top of the iceberg. This part of the knowledge resource is easy to find and recognize and therefore also easier to share. Beneath the surface, invisible and hard to express, is a momentous part of the iceberg. This hidden part symbolizes the tacit knowledge resources. Michael Polanyi (1966) expressed this, as “we know more than we can express”. When Prahalad and Hamel (1990) talk about core competencies they explain it to be more than the explicit knowledge of “know-what” it requires the more tacit “know-how” to put “know-what” into practice. Brockmann and Anthony (1998) expressed that structured and explicit knowledge is important but to achieve excellence in a job one have to master higher levels of knowledge, the unstructured and intangible tacit knowing.

Discourses on tacit knowledge tend to be stormy due to differences in interpretation of the concept itself (Gustavsson 2000). To better understand these similarities and differences a study was made on the different definitions presented in the texts¹.

Scholars seem to agree that tacit knowing is highly personal (among others Stenmark 2001; Polanyi 1956; Meso and Smith 2000; Vincenti 1990; Raghuram 1996; Davenport and Prusak 1998; Gore and Gore 1999; Wagner and Sternberg 1985; Nonaka and Konno 1998) abstract (among others Polanyi 1958, 1966; Lubit 2001; Ropo and Parviainen 1999; Meso and Smith 2000) and difficult to express (among others Polanyi 1958; 1966; Boisot 1995; Gustavsson 2000; Lubit 2001; Nonaka and Konno 1998; Wagner 1987; Cowan, David and Foray 2000). Due to these characteristics they also agree on the difficulty of tacit knowledge diffusion (Polanyi 1966; Nonaka and Takeuchi 1995; Nonaka and Konno 1998; Bennett and Gabriel 1999; Leonard et al. 1998; Zack 1999; Holtshouse 1998). They also agree on experience being a main source of tacit knowledge creation (Polanyi 1958; Nonaka and Takeuchi 1995; Augier and Vendelo 1999; Wagner and Sternberg 1985; Noteboom, Coehoorn and Zwan 1992). Last, a common opinion is that tacit knowing is related mainly to practicality (Wagner and Sternberg 1986; Cruise O'Brien 1995; Arora 1996; Noteboom, Coehoorn and Zwan 1992)

Differences on the other hand can mostly be found in underlying ontological assumptions. Like in opinions of possibility and need for externalization of tacit knowing. On one hand Michael Polanyi (1966) as well as Nelson and Winter (1982) and Gustavsson 2000) considers knowledge that is impossible to express as non-existent. On the other hand, Wittgenstein claims its existence (in Rolf 1991) The ability to express tacit knowing depends on various elements such as language and is more used as a tool for using knowledge. There may be a gap between knowledge and the ability to use the language to articulate it but this gap is individual not general. Johnson, Lorenz and Lundwall (2002) discusses that knowledge seldom can be completely codified without losing some of its original quality. Another reason for not expressing tacit knowing is more related to the unwillingness to articulate the knowledge than to the actual ability or even to the lack of need to articulate it (McAulay and Russell 1997). Gustavsson (2000) also discusses knowledge to be tacit because of it being

¹ The definitions are presented in appendix 1

suppressed. Polanyi (1958) asserts that it is possible to diffuse tacit knowing without any articulation while Nonaka and Konno (1998) in their SECI-model consider a form of articulation of tacit knowledge necessary for externalization. Polanyi says that knowledge can be seen in two dimensions, the focal and the tacit dimension. Focal, is knowledge about the phenomenon in focus while the tacit dimension is used as a tool to handle what is in focus. Hence the focal and the tacit knowing are complementary (Sveiby 1994). Cook and Brown (1999) argue differently, as they assert that explicit and tacit knowledge are two different kinds of knowledge and that neither can be made from, or changed into the other. Differences can also be found in the existence of tacit knowing as individual/collective knowledge. As the definitions show us most scholars agree on tacit knowing as individual but there is discussions of organizational or collective tacit knowing (Madhavan and Grover 1998; Athanassiou and Nigh 2000) and for example Brockmann and Anthony (1998) discusses culture as a collective form of tacit knowledge.

3. Tacit knowing of tacit knowledge - Epitomes of Tacit Knowledge

J. Horvath (1999) asks if identifying subtypes of tacit knowledge could be used to optimize or tune our approach to knowledge management. Subtypes used in this paper are epitomes of tacit knowledge (ETK). In everyday life different forms of epitomes for tacit knowledge are used. These epitomes are artifacts to help us articulate the diffuseness of tacit knowing to make it more explicit. (Haldin-Herrgard 2003) A good example of this is Nicholas och George Hatsopoulos that starts their chapter "The Role of Tacit Knowledge in Management" (eds. Sternberg & Horvath 1999:141) by saying:

"Because neither author is well versed in the literature concerning tacit and implicit knowledge, the term used in this chapter – such as *intuition* and *gut-feeling* – are colloquial versions that may only partially match the scientifically defined term used in cognitive science".

Although many of these epitomes are created for pragmatic use also academia have made use of them in scientific work. Scholars not only use them as part of their vocabulary when they discuss research but also as input in the same in collecting information on tacit knowing (see Giunipero, Dawley, Anthony 1999; Somech and Bogler 1999; Brockmann and Simmons 1997). ETK are often used implicitly as they are a natural part of the everyday language. Like tacit knowing they are often abstract concepts used as self-evident and the use of them increases the ability to interact through communication. As in tacit knowing the value of the

ETK is decreased if they are used separated from the situation, used in a different culture or linguistic setting, as these concepts are products of a cultural setting and as that, a result of use of language in interaction. An example is a Swedish phrase that translated is “he has his thumb in the middle of his hand”. This refers to a person without tacit practical skills. In English the similar expression is “he is all fingers and thumbs” or “his fingers are all thumbs” depending on your culture. Like tacit knowing the ETK are based on experience, abstraction and is often situational and implicit. As such the use of epitomes of tacit knowledge in scholarly literature on tacit knowledge can be considered as the scholars tacit knowing of the concept tacit knowledge.

Different authors on both knowledge and tacit knowing have earlier done classifications. Knowing has been classified into two dimensions: the intellectual (“knowing what”) and the practical (“knowing how”). Where “knowing how” can be seen as the more tacit dimension (Polanyi 1966; Ryle 1950) Also tacit knowledge has been classified into two dimensions, the technical and the cognitive dimension. The technical dimension can be viewed as expertise “at ones fingertips” and it encompasses information and expertise in relation to “know-how”. The cognitive dimension consists of mental models, beliefs and values and it reflects our image of reality and vision of the future. (Nonaka and Takeuchi 1995; Gore and Gore 1999) Like tacit knowing has been classified by technical or cognitive dimension to elucidate the use of it, a systematization of the epitomes of tacit knowledge could elucidate and unify our use of them.

A literature review was done on scientific literature discussing tacit knowledge published between 1958 and 2002. The literature consisted of books and articles dealing with knowledge and especially tacit knowing. The review resulted in 149 different epitomes of tacit knowledge used. Some of these epitomes were though used in different meanings by different authors and, as opposite, different epitomes were used on same or similar topics by different authors.

The most frequently used ETK were as follows:

* *intuition* (Augier and Vendelo 1999; Leonard and Sensiper 1998; Sternberg and Horvath 1999; Durrance 1998; Giunipero, Dawley and Anthony 1999; O’Dell and Grayson 1998; Saint-Onoges 1996; Cook and Brown 1999)

- * *skills* (Polanyi 1966; Augier and Vendelo 1999; Bennett and Gabriel 1999; Brockmann and Anthony 1998; Nonaka and Takeuchi 1995; Cook and Brown 1999)

- * *insight* (Leonard and Sensiper 1998; Durrance 1998; Giunipero et al, 1999; Bennett and Gabriel 1999; Brockmann and Anthony 1998; Brown and Duguid 1998)

- * *know-how* (Giunipero et al. 1999; O'Dell and Grayson 1998; Nonaka and Takeuchi 1995; Brown and Duguid 1998; Reuithe and Aberg 2000; Cook and Brown 1999)

- * *beliefs* (Durrance 1998; Saint-Onoges 1996, Nonaka and Takeuchi 1995; Brown and Duguid 1998; Daniels 1995)

- * *mental models* (Leonard and Sensiper 1998; Durrance 1998; Nonaka and Takeuchi 1995 Gore and Gore 1999)

- * *practical intelligence* (Giunipero et al. 1999; Somech and Bogler 1999; Schmidt and Hunter 1993)

Intuition expressed as directly knowing or learning without conscious reasoning or making choices without formal analysis. (Behling and Enckel 1991 in Brockmann and Anthony 1998) Related expressions to intuition are *non-analytical behavior, automatic knowledge, or flashes of inspiration or insight.*

Skills are used as such but also with specifications like *inductive, negotiation, physical, coordination* or *cognitive skills*. This is perhaps the epitome that is most used without any form of definition. Some other terms such as *ability, crafts and practical knowledge* are closely related and often used in the same meaning

Insight is used as understanding, often in a sudden form but also as “glimpses” into knowledge (ones own or others)

Know-how often expressed as the ability to put know-what into work which is to great extent the product of experience (Brown and Duguid 1998). Know-how is mostly used as such but also with specifications as *practical* and *collective know-how*.

Beliefs used as a set of understandings that reflect our perspective of the world. Beliefs are also expressed as *opinions* (Giunipero et al. 1999) and sometimes even as *attitudes* (Leonard and Sensiper 1998; Brown and Duguid 1998)

Mental models are cognitive structures formed by the abstractions of experience. They reflect our perspectives of the world around us. (Giunipero et al. 1999) Other ETK like *cognitive schemas*; *mental maps* and *schemas* are used as same meaning.

Practical intelligence expressed as “a persons ability to apply components of intelligence to everyday life” (Somech and Bogler 1999)

A variety of others epitomes relating to those mentioned-above, as well as more focused forms were identified. In a systematization of the epitomes a close proximity resulted in clusters. An example is *mental models* that includes cognitive schemes, mental maps, schemata

3.1 Systematization of Epitomes of Tacit Knowledge

A conceptual system of ETK provides us with the more implicit and intangible image the scholar's perception of tacit knowing than the definitions provide us with. Linked to the definitions, the system can facilitate and improve the research process as it provides a more holistic perspective on the subject. Systematization can also facilitate the interaction between researcher and informant by counteracting misunderstandings and creating mutual understanding. ETK are used in discussions and interviews with informants. A shared meaning of the concepts helps the informants to externalize the tacitness of their knowledge as well as the researcher's understanding of the given information.

ETK are sorted into two taxonomies regarding to commonalities:

- Extent of abstraction in *abstract* and *concrete* and actors involved in *individual*, *team* and *collective*
- Activities it affects on in *mental*, *sensuous*, *social* and *practical*

Taxonomy on abstraction and actor(s). A distinctive feature of ETK in the literature is difference in abstraction. But ETK shows that different forms of abstraction can be discerned. Another distinctive feature is based on the actors involved. Although tacit knowing usually is perceived as highly individual and personal many of the epitomes refers to more collective forms of tacit knowing.

Extent of abstraction: Although the main characteristic of tacit knowing is tacitness as abstraction, it can be seen that extents on abstraction vary from completely abstract to quite concrete in the concepts used. Several of the concepts can be considered abstract in the sense that they cannot be conveyed to others. Intuition is one of the most used epitomes of this category. Intuition as well as hunches, gut-feelings, “feelings”, beliefs and mental-models, can not be tapped into by others than those involved in the specific situation and can therefore be considered intangible. Other ETK may in themselves be considered intangible but lead to more concrete results expressed in our behavior or in the result of the work. Examples are insights, talent, judgment, rules-of-thumb, and practical intelligence. Although the knowledge in itself may be of abstract character it can appear in more tangible forms. Culture and know-how consist of both abstract and concrete forms of knowledge but can easily be recognized by an uninitiated. In spite of difficulties in articulating tacit knowing, high visibility can be seen in many of the used epitomes. These epitomes can be considered highly visible both for actors and outsiders. Examples are best-practice, skills, improvisation, instinctive reaction and ability.

Actors included in the process: Some ETK includes only the individual as an actor. The same feeling of intuition, insight, taste, artistic-vision, gut-feeling or hunch cannot be felt by more than one individual and it is impossible to transfer the same feeling to an other actor. ETK like mental models, attitudes, know-how, judgment, skills and improvisations include not only individuals as actors but also teams and groups of actors. We all have our individual mental models and know-how but in teams shared mental models and a collective know-how developed by former and present members know-how also can be found. Best-practice,

common sense, and culture are exclusively collective; they do not exist without a group. These are socially or functionally based and represent collective forms of tacit knowing.

Collective	common sense common beliefs shared norms organizational memories shared meaning	culture collective know-how common in experience collective ability shared values social institutions shared code	best practice
Individual/ Team	cognitive schemes unconscious norms mental models attitudes opinions a groups sense inexplicable mental processes understanding	non-analytical behavior automatic knowledge experience knowledge base values perspective judgment non-canonical practice rule-of-thumb knowledge base predictions routinized knowledge values opinion	life-examples creativity skills bodily communication coordination management negotiation operational patterns of experience improvisation tricks estimation routines techniques genres
Individual	intuition feeling for beliefs hunch gut-feeling emotional knowing flashes of inspiration percepts know in ones body feels as... looks as... thoughts sounds as....	skills bodily cognitive inductive people intuitive knowledge flash of insight percept care-why know-how insight second nature talent practical intelligence unarticulated preferences inner competence personal competence oneness of body and mind people knowledge sense-making	sense making instinctive reaction artistic vision ability skills physical social crafts taste after the fact awareness masters sureness of action skillful sense-making
	Abstract		Concrete

Fig. 2. Commonalities regarding to abstraction and actors

Taxonomy on affected activity. ETK are also grouped according to which activity is affected by tacit knowledge. Earlier scientific work has been done on the cognitive/technical dimensions and intellectual/practical dimensions of tacit knowing. (Gore and Gore 1999;

Polanyi 1966; Ryle 1950) The literature review showed that these dimensions do not illustrate ETK completely. Activities used in this paper are *mental, sensuous, social and practical*.

Some ETK are related to mentality and influences actions taken in mental processes such as in problem solving. We use intuition, insights and judgment as we detect, analyze and solve a problem. Cognition can also be grouped as a mental process and our mental models have an influence on our cognitive abilities.

Many of the epitomes used include different forms of emotional or sensuous factors. We often use epitomes including feelings, both physical and mental feelings. We have not only “feelings” but also gut-feelings or we “know in our body”. Also other forms of sensuous factors such as artistic vision and taste are included in the ETK.

Tacit knowing also has influence on and is influenced by social processes. Many of the norms that control our relations and interaction with other people are tacit. The most extensive form of social tacit knowledge can be found in culture. Irrespective of the extension of culture (national or organizational) the foundation of it is in tacit knowledge concerning behavior, values and language, etc.

A common opinion on tacit knowledge is the practicality of it. This is reflected in a great variety of ETK used in practical work. Most commonly used are not only different forms of know-how and skills but also ETK like experience, best practice, rule-of-thumb and practical intelligence.

In some ETK the meaning of a concept results in a different grouping of the same concept. Ability for example can be grouped as both mental and practical epitome depending on the meaning of the concept. Ability as endowment may be grouped as mental ETK whereas ability as skillfulness grouped as a practical ETK. The same is applied on talent. An important function of tacit knowledge is the ability to grasp a holistic perspective on for example a problem. This can also be found in the ETK. The holistic ETK are difficult if not impossible to sort into only one group; they belong in some way to all groups. Examples of this are inner or personal competence that includes all four different competencies.

Mental	Sensuous	Social	Practical
ability	feeling	common beliefs	know-how
skills	skills	skills	skills
cognitive	bodily	communication	physical
coordination	people	management	bodily
inductive	emotions	negotiation	operational
management	artistic vision	social	collective know-how
negotiation	taste	people	skillful
intuition	attitudes	shared values	best-practice
intuitive knowledge	gut-feeling	values	rule-of-thumb
mental models	unarticulated preferences	shared meaning	practical intelligence
insight	“get a feel for”	culture	tricks
flash of insight	emotional knowing	norms	crafts
flash of inspiration	oneness of body and mind	shared norms	ability
mental maps	know in ones body	common sense	patterns of experience
schemes	”look of...	life examples	after-the-fact-awareness
organizational mind	“sound of...	a groups sense	automatic knowledge
sense-making	“feel of.....	social institutions	intimation
beliefs	care-why	people knowledge	masters sureness of action
creativity	instinctive reaction	shared code	non-canonical practices
judgment	a groups sense		routinized knowledge
opinion			thinking in practice
hunch			life examples
organizational memories			genres
perspective			improvisation
talent			routines
after-the-fact-awareness			techniques
inexplicable mental processes			
percepts			
predictions			
sense making			
estimation			
knowledge base			
thoughts			
understanding			

Holistic: inner competence, personal competence, non-analytic behavior, second nature, experience, talent, common in experience

Fig. 3. Commonalities regarding to affected activities

4. Conclusions

In academic literature many different epitomes of tacit knowledge are used. The use of ETK facilitates the explication of different forms of tacitness in knowledge. Many ETK express the same concept to some scholars and different concepts to others. ETK are used as instruments in scientific research; as vocabulary in collection of empiric information as well as vocabulary in discussions and presentations by scholars on this topic

The explicit and expressed knowledge on tacit knowing can be found in the definitions of tacit knowledge. These definitions differ to some extent but some factors are agreed upon. To summarize most scholars define tacit knowledge to be

Personal, abstract, practical and obtained by experience

Most scholars also agree on tacit knowing to be an important part of expertise. Experts on the concept of tacit knowledge in the academic community can be found in scholars publishing writings on knowledge and especially on tacit knowledge. As experts they are perceived to possess tacit knowing of their specific topic: tacit knowledge.

In the productions of the experts their tacit knowing can be perceived in the texts by the explicit or implicit use of concepts of tacit knowledge. To tap into this tacit knowing we have to “read between the lines” or better “read beyond the words” they use.

What does the scholar’s tacit knowing tell us about the concept of tacit knowledge? The image of knowledge as an iceberg seems to correspond with the findings of the analysis of the literature review. If the visible top of the iceberg refers to explicit knowledge this corresponds with the explicit definitions of tacit knowing found in the literature. Beyond the definitions and more hidden in the texts we find a more comprehensive image of tacit knowing represented by ETK used to explain tacit dimension of knowledge. The image of an iceberg shows us that the hidden part is larger than the visible part, as tacit knowing exceeds explicit knowledge. This is shown by the use of ETK as they enlarge the concept of tacit knowledge. In the use of ETK the concept of tacit knowledge cannot only be seen as exclusively personal but can be found in groups like in attitudes or even as exclusively collective as in culture. There may be a difficulty to articulate tacit knowing but other forms can be highly visual as for example the ETK “good taste”. This questions the abstraction in tacit knowledge. Practical forms of knowledge show to account for only one of the activities affected by tacit knowing. Much of tacit knowing is used in particularly mental activities as in mental models but also in social and sensuous activities as in people-skills and feelings. The term practical in the definitions of tacit knowledge should perhaps be understood as “the ability to get things done” irrespective of the activity or competence needed to manage it. So the proposition is to enlarge the concept of tacit knowledge to be:

Tacit knowledge is personal, but can be shared by individuals collectively, abstract but expressible in other forms than verbalization, affecting the ability to act independent of activity and competence and obtained by experience.

What does the extension of the concept result in, in research? In research on tacit knowledge difficulties has been connected to the nature of tacit knowing. Characteristics like abstraction, difficulties to articulate, implicitness, individuality and practicality, all raising different difficulties to researchers studying tacit knowing. An extended concept offers new possibilities to study tacit knowing or at least stress out the benefit of earlier methods. The abstraction and actors included in the ETK show the possibility to use and benefit of methods including less articulation but perhaps more actors as for example observation of interaction in teams or in a master-apprentice relationships. A conscious use of ETK is excellent also in methods including articulation like in interviews. An interview method based on ETK is "cards on ETK". (Haldin-Herrgard 2003) The method has been tested and proved to be successful in research. ETK has offered a mean to collect comprehensive and yet focused empirical material on the use, meaning and importance of tacit knowledge (Haldin-Herrgard 2003) Another important result of an extension of the concept is that the importance and hence interest in tacit knowing is raised due to the extension of affected activities as well as abstraction and actors. The affect of tacit knowing in mental and social work may offer scholars new interesting perspectives.

What does the extension of the concept result in, in management? A main difficulty in tacit knowledge management is the difficulty to diffuse and share tacit knowing. This difficulty is related to the personality and abstraction of tacit knowing and is therefore affected by an extension of the definition. If tacit knowing is seen as less personal and abstract than we have earlier perceived, this offers new possibilities to create methods that enhance tacit knowledge diffusion. At least it emphasizes the positive role social interaction, like teamwork, has in diffusion of tacit knowledge. It also makes us conscious of possibilities to develop methods not based on articulation but other expressive forms like for example modeling. To include more activities than practical to tacit knowing raise our consciousness of a wider importance of tacit knowing and that it is appropriate to pay attention to tacit knowing not only in practical work but also in work including mental, sensuous and social work. This extension on activities affected by tacit knowing support earlier research on tacit knowing used by

managers. Results like these may give us new perspectives on management development and the methods used in training managers and managing. It also increases consciousness of the role of tacit knowing in work earlier labeled as non-tacit (at least where it is preferable to excluded tacit forms like intuition, hunch and gut-feeling) for example in financial analysts or technicians (Haldin-Herrgard 2003).

The issue of knowledge is like an ocean, wide and deep, but if you come up against the iceberg of tacit knowledge I suggest you to dive under the surface. You will find that tacit knowledge includes much more and is even more interesting than you thought it would be.

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Appendix 1: definitions of tacit knowledge

Tacit knowing is that we know more than we can say (Polanyi 1958, 1966: 4, the most used definition)

Tacit Knowledge entails information that is difficult to express, formalize or share and it is unconsciously acquired from the experiences one has while immersed in an environment (Lubit 2001:116)

Tacit knowing is defined as knowledge that enters into the production of behaviours and/or the constitution of mental states but is not ordinarily accessible to consciousness. (Ropo and Parviainen 1999:3)

Tacit knowledge consists of mental models, beliefs and persuasions of each individual employee that are so ingrained as to be taken for granted. It resides within the individual and is difficult to express in words. (Meso and Smith 2000:225)

Tacit is defined as 'not openly expressed or stored, but implied, understood and inferred' (Wong and Radcliff 2000:494)

Tacit knowledge.... may be defined as implicit, procedural, uncodified, embodied knowledge (Cruise O'Brien 1995:114)

.....the implicit, wordless, picture less knowledge essential to engineering judgement and workers' skills..... The knowledge itself can come in the end only from individual practice and experience (Vincenti 1990 used in Wong and Radcliff 2000: 494)

Such knowledge is typically derived from experience, from learning by doing, rather than from learning by theory. Thereby it is, so to speak, second nature, and hence intuitive and self-evident, not subject to explanation or justification. It is concrete rather than abstract, and non-analytical. As a result, it is embodied in personal experience and difficult to transfer other than by transfer of the person in which it is embodied (Noteboom, Coehoorn and Zwan 1992 used in Wong and Radcliff 2000: 494)

.....tacit knowledge may be knowledge which is, or could be, available to conscious awareness and yet typically remains unarticulated, at least, in any formal sense. (Myers and Davids 1993 used in Wong and Radcliff 2000: 494)

Tacit knowledge has a personal quality that makes it hard to formalize and communicate (Raghuram 1996 used in Wong and Radcliff 2000: 494)

....tacit knowledge represents those components of technology that are not codified into blueprints, manuals, patents and the like. In other words, tacit knowledge is intangible knowledge, such as rules of thumb, heuristics, and other "trick" of the trade. (Arora 1996 used in Wong and Radcliff 2000: 494)

Tacit knowledge is highly personal and hard to formalize, making it difficult to communicate or share with others. It is deeply rooted in an individual's actions and experience as well as in the ideals, values or emotions he or she embraces. (Nonaka and Konno 1998:42)

The concept tacit knowledge is used mostly to describe practical know-how. It is acquired indirectly and informally, sometimes even not verbalized, but it is essential for one's survival and success in different settings. Tacit knowledge is defined as work-related practical knowledge (Wagner and Sternberg 1986:)

Tacit knowledge includes the intuition, perspectives, beliefs and values that peoples form as a result of their experiences" (Saint-Onge 1996: 10)

Tacit knowledge is action-oriented knowledge acquired without direct help from others, that allows individuals to achieve goals they personally value (Sternberg, Wagner, Williams and Horvath 1995 used in Somech and Bogler 1999:605)

Tacit Knowledge is practical know-how that usually is not openly expressed or stated and which must be acquired in the absence of direct instruction (Wagner 1987, used in Guinipero et al 1999:43)

Tacit knowledge is not easy to see or express, it is highly personal and hard to formalize. It may well be rooted in the individual's experience, attitude, values and behaviour patterns (Gore and Gore 1999:556)

Tacit Knowledge is an idiosyncratic, subjective, highly individualized store of knowledge and practical know-how gathered through years of experience and direct interaction within a domain or profession (Wagner and Sternberg 1985, used in Guinipero et al 1999:43)

Tacit knowledge is "not codified knowledge (Cowan, David and Foray 2000:212)

Tacit knowledge is not yet explicated (Spender1996 used in Leonard and Sensiper 1998:113)

Tacit complex knowledge, developed and internalized by the knower over a long period of time, is almost impossible to reproduce in a document or database. (Davenport and Prusak 1998)

A meaning in tacit knowledge is that it is wordless, that it lacks a verbal language (Gustavsson 2000:109 authors translation)

Tacit knowing describes the form in which we hold our least communicable knowledge assets in the E-space (Boisot 1995: 489-506)