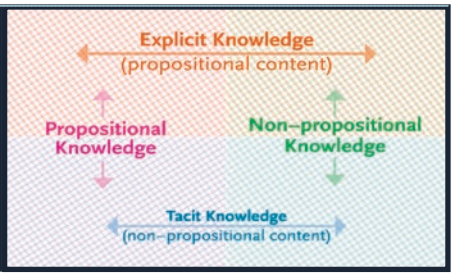
DesignResearchQuarterly
V. 2:2 April 2007
Design Research Society
ISSN 1752-8445
www.designresearchsociety.org



Mapping the Meaning of Knowledge in Design Research

Kristina Niedderer
University of Hertfordshire

Knowledge plays a vital role in our life in that it reflects how we understand the world around us and thus determines how we act upon it. In this sense, knowledge is of particular importance for designers because they act to shape our world. Conventionally, knowledge creation has been assumed by (design) research. However developments of using practice within research have pointed to knowledge creation within and through practice. This has raised the question of the meaning, role and format of knowledge in both research and practice, and about the compatibility between knowledge of research and practice.

The research presented in this paper has set out to investigate the concept of knowledge with regard to this question. The paper begins by considering some of the main problems with knowledge in research within design, and more generally in the creative and practice-led disciplines. It then examines the meaning of knowledge in relation to its philosophical foundations. On this basis, the discussion reconsiders the meaning, role and format of knowledge, and the impact of this for the conduct of research.

1. Introduction: Why Ask?

What are the meaning, role and format of knowledge in research and practice? This question has arisen for design in the UK, as well as more generally for creative and practice-led disciplines (CPDs), because research regulations and requirements in the UK remain silent about what knowledge and understanding mean in the context of their specifications while implicitly prioritising propositional knowledge over knowledge that cannot be expressed in that form (Niedderer 2007).

This has led to a number of problems concerning the role and format of knowledge in research and practice in the UK. For example, because of the language-based mode of propositional knowledge, the implicit prioritisation of propositional knowledge seems to exclude certain kinds or formats of knowledge associated with practice, which are often called practical, experiential, personal, or tacit knowledge and which evade verbal articulation. Polanyi (1958: 50) puts the importance that practitioner-researchers assign to practical knowledge succinctly into words:

> '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 this knowledge.'

Continued p. 5

Table of Contents:

'Rules of art' in this context refers to subject specific knowledge expressed in form of theories (maxims). Polanyi indicates that, while useful, there is another kind of practical or personal knowledge that is necessary to complement this theoretical knowledge in order to make it applicable. However, what exactly this knowledge is and how it can be included in research has remained elusive. This has created problems with the inclusion of practical knowledge in research and in turn with the applicability of research findings within practice.

Researchers in the creative disciplines have tried to overcome this problem through the use of creative practice in research in order to achieve the inclusion of tacit knowledge, which in turn has caused debate about what is formally acceptable as knowledge in research (Niedderer 2006). This research sets out to review current concepts and understandings of knowledge and their relationships with regard to the implications for research in design and other creative and practice-led disciplines. The aim of this inquiry is to help clarify the role, format and inclusion of tacit (experiential) knowledge in these disciplines, in particular as regards its inclusion through the use of creative/professional practice, and to identify potential solutions or ways of dealing with the identified problems.

While this investigation has evolved from a national problem in the UK, the problem has also proven to be one of international significance, which is attested by many international discussion lists concerned with this problem (e.g., PhD-design <http://www.jiscmail.ac.uk>), conferences (e.g., Research into Practice <http://www. herts.ac.uk/artdes1/research/res2prac/confhome.html>), and publications (e.g., Durling et al. 2002). In this paper, the problem is therefore discussed on a generic level in order to maintain its international relevance. Similarly, while the problem is one of particular relevance to design, it is also shared by the wider community of creative and practice-led disciplines (e.g., art, craft, education, and health & nursing), and it is here discussed as such. In explanation and justification of such a generic understanding, which accommodates subject-specific individualities, Starszakowna, 2002, argues that

> 'the concept of knowledge in art and design is, or should be, no different from the concept of knowledge in other disciplines. It is the constant search for, and ultimately the acquisition and dissemination of, a body of knowledge within particular areas or parameters which signifies a specific discipline. While the particular form that this knowledge might take will therefore vary, both between disciplines and within specialist areas within disciplines, such acquisition of knowledge is universal' (Abstract).

A final aspect that might need clarification is the distinction between research and practice that is used in this paper, because either may occur in the context of the other. For example, a practitioner might also work in the academy and pursue research to inform their practice. Therefore, as distinguished previously (Niedderer 2005/2007), the term 'research' is being used to denote the systematic inquiry to the end of gaining new knowledge, and a 'researcher' is a person who pursues research (e.g., in design). 'Practice' is used to refer to professional practice (e.g., in design) or to processes usually used in professional practice to produce professional work for any purpose other than the (deliberate) acquisition of knowledge. 'Practitioner' accordingly refers to anyone who works in professional practice.

2. What is Missing?

This section examines two examples from CPDs in order to draw out more clearly the problems of knowledge in research, how these problems are related to the prioritisation of propositional knowledge, and how the practice knowledge of these disciplines is different. Before we look at the examples, we need to clarify what we mean by propositional knowledge. Propositional knowledge is most commonly defined as 'justified true belief'. Grayling (2003: 37) explains that

> 'this definition looks plausible because, at the very least, it seems that to know something one must believe it, that the belief must be true, and that one's reason for believing it must be satisfactory in the light of some criteria – for one could not be said to know something if one's reasons for believing it were arbitrary or haphazard. So each of the three parts of the definition appears to express a necessary condition for knowledge, and the claim is that, taken together, they are sufficient.'

Despite of continued criticism, the definition of knowledge as 'justified true belief' has remained the prevailing definition, and Niedderer (2007) has shown that this understanding of propositional knowledge is implicit in the definition of research because of additional requirements such as the textual/written presentation of an intellectual position (proposition, thesis – 'true belief'), because of

Continued p. 6 →

the logic of verification and defence of this intellectual position through argument and evidence (justification), and the requirement for generalisability/transferability and explicit and unambiguous communication.

The following two examples show that there arise difficulties with this conventional understanding of research at different stages, and that it is at those stages that tacit knowledge is missing. One of the selected two examples is from design/engineering, the other from music. The examples have been drawn from existing literature which is concerned with the problem of knowledge in relation to practice. They have been chosen because they offer discussion of two important generic knowledge areas of CPD's, one of which is related to procedural knowledge and expertise using the example of technical development, while the other is related to experiential knowledge and connoisseurship, using the example of aesthetic evaluation and judgment.

Example 1:

In the 1960's, a Canadian research laboratory successfully developed and built a so-called TEA-laser. British attempts to replicate the laser on the basis of written information or a third-person-informant however failed as long as the tacit knowledge of informants who had participated in building the original laser was not included through their personal engagement in the replication-project (Collins 1985, Neuweg 2002: 42). Collins' (1985) study of the replication attempts further showed that an extended period of contact was required between the expert and the learner to transfer the tacit knowledge, and that the learner could not tell whether they had acquired the relevant knowledge or skill until they tried it.

This example suggests that tacit knowledge is developed within the research process and as part of the research (here: the development of the laser), and that it evades the conventional textual communication means of research. Polanyi (1958: 53) describes this situation as follows:

> 'An art which cannot be specified in detail cannot be transmitted by prescription, since no prescription for it exists. It can be passed on only by example from master to apprentice.'

In summary, knowledge which 'cannot be specified' is usually associated with practical knowledge and skill. It belongs to vocational training and is (today) widely regarded as distinct and excluded from academic research, because it withstands articulation and argumentation and thus wider dissemination (Herbig et al. 2001). Nevertheless the inclusion of tacit knowledge seems essential for success, both in terms of tacit knowledge being brought into the research process as well as in terms of its communication for application, and is therefore associated with expertise, which can be defined as 'an intuitive grasp of the situation and a non-analytic and non-deliberative sense of the appropriate response to be made' (Berliner 1994: 110; cf. also to the understanding of expertise in the 5-stage model of Dreyfus and Dreyfus 1988).

Example 2:

For the second example, I want to draw on an example which Polanyi uses and which concerns the 'touch' of pianists (Polanyi 1958: 50). He makes the observation that, technically, it is difficult to account for the difference in touch, which is so prized, and which distinguishes any great pianist. Also, it seems fairly impossible to describe it sufficiently either for the purpose of teaching, or for the purpose of evaluation. This becomes clearer if we cast this example in terms of research. If one were to conduct a comparative study between the 'touch' of different pianists, how were we to measure and evaluate the different 'touches' if they evade scientific measurement and analysis? In this case, judgement would need to rely on (perceptual) experience and personal judgement, also known as connoisseurship. Connoisseurship in the context of this investigation is referring to an ability for very fine (qualitative) discrimination that is (usually) beyond scientific measurement and that is acquired through extensive training (Polanyi 1958: 54, Beeston and Higgs 2001: 110).

In these two examples, we have seen that tacit knowledge is an important requirement for achieving best results in research and practice, which is associated with expertise and connoisseurship. In particular, tacit knowledge plays an important role both in the research process and in evaluating and communicating research outcomes. In other words, tacit knowledge seems important for the generation and application as well as the experience and judgement of research and its results, and for creating new experiences, abilities, and knowledge. In the following, we shall examine what exactly we understand with tacit knowledge, why and how it has this important role, and how it relates to propositional knowledge, drawing on philosophical sources in order to give the discussion a better grounding.

Continued p. 7

Mapping the Meaning... continued from p. 6

3. What Kinds of Knowledge?

We have talked about two different kinds of knowledge, tacit and propositional, but these two terms are not usually paired. Rather, 'tacit knowledge' tends to be paired with 'explicit knowledge' (Neuweg 2002). 'Propositional knowledge' is variously paired with 'non-propositional knowledge' such as experiential or perceptual knowledge (knowledge by acquaintance) and/or 'procedural knowledge' (Williams 2001: 98, Grayling 2003). While the explicit - tacit knowledge-pair has been formed to denote and distinguish knowledge by the characteristic of communication, propositional and non-propositional knowledge pairs provide distinctions concerning their nature. However, the relationship between propositional and non-propositional knowledge seems not as clear-cut as that of explicit and tacit knowledge, because we find a number of different kinds of knowledge clustered under 'non-propositional knowledge'.

In the creative and practice-led disciplines, a variety of further terms are being used such as practical knowledge, skills knowledge, process knowledge, personal knowledge, implicit knowledge, professional knowledge, situational knowledge, control knowledge, complex knowledge, conventional knowledge, cognitive knowledge, codified knowledge, public knowledge... (e.g., Polanyi 1958, Reber 1989, Higgs and Titchen 1995, Nonaka and Takeuchi 1995, Refsum 2002, Eraut 2003, Abidi, et al. 2005, Miles, et al. 2005). Most of these terms seem to have been created as descriptors for different kinds of phenomena of knowledge. While some of them offer important distinctions for their field, to discuss all of these terms in detail is beyond the scope of this paper. This research focuses on the distinction between propositional and non-propositional, and explicit and tacit knowledge, which seem to be the most important pairs, in order to investigate in more detail their meaning and their relationship. Where possible I will point out and differentiate synonym terms.

Since knowledge is essentially a philosophical concept, this investigation looks at philosophical concepts of knowledge before re-introducing them into the problematic of CPDs. Although there are also a number of different terms of knowledge used in philosophy, there seems to be some consent about what the central terms are: propositional knowledge, knowledge by acquaintance, and procedural knowledge (e.g., Hospers 1990, e.g., Williams 2001, Grayling 2003). Grayling (2003: 39) explains that the definition of knowledge as justified true belief 'is intended to be an analysis of knowledge in the propositional sense' rather than of knowledge that one might gain by being acquainted with something or someone, or that enables someone to do something (skill).

While there has been much debate about this definition of knowledge in the attempt to defeat or improve it, until now it has remained the central definition. An extensive and plausible defence is provided by Williams (2001) who proposes an approach that can be seen as a mediating way between the two opposed positions of Foundationalism and Coherentism. While Foundationalism relies on foundational beliefs based on empiricism for the justification of knowledge ('prior grounding requirement') which creates problems with accounting for any internal reality or the reality of other minds (Williams 2001: 81ff), Coherentism relies on an intrinsically coherent system of beliefs that in turn has difficulties with accounting for our knowledge of (external) reality (Williams 2001: 117ff).

In mediation of these two approaches, Williams (2001: 159-172) proposes a third approach, which he calls 'Contextualism' and which assumes that we can rely on our experience of external reality until we have reasons to challenge it (default and challenge requirement). Context-dependent, this allows us to assume certain beliefs as foundational beliefs without the requirement of foundational atomism, but it also releases us from the circularity of Coherentism. These assumed foundational beliefs may be opened to scrutiny if the context changes. Williams argues that this approach is permissible because of the normativity of knowledge, which is not some a priori given, but itself a human construct. The Contextualist approach seems to describe the way in which research operates well in that it takes certain beliefs as foundational on which it then tries to construct a coherent argument (cf. Niedderer 2007). In the following discussion, I will therefore adhere to Williams' contextualist approach to (propositional) knowledge.

While propositional knowledge has been at the centre of epistemological discussion, knowledge by acquaintance and procedural knowledge seem to have been under-represented in these discussions, and although philosophers have looked at these concepts separately (e.g., BonJour 2001, Gunther 2003, e.g., Maund 2003, Crane 2005), a satisfactory integration of these issues with epistemology so far seems outstanding. Therefore, we now examine the intrinsic characteristics of these concepts in an attempt to relate them for the purpose of this research.

Continued p. 8 →

4. Relating different Kinds of Knowledge

Having discussed the definition of propositional knowledge, we now need to look more closely at the characteristics of propositional knowledge. Propositional knowledge, which is associated with the aspect of knowing that is usually expressed in form of statements that can be verified or falsified and that allow us to credibly believe that something is one way or another. In contrast, procedural knowledge refers to knowing 'how to do something in the sense of an ability or skill' (Grayling 2003: 38). Sternberg (1999) associates procedural knowledge with tacit knowledge, because its essence is difficult to put into words as we have seen in the examples above. Drawing on Anderson (1976), Reber characterises procedural knowledge further by distinguishing it from declarative knowledge, which is here used as a synonym to propositional knowledge and which points to its explicit character.

> 'Anderson's key distinction is that between declarative knowledge, which is knowledge that we are aware of and can articulate, and procedural knowledge, which is knowledge that guides action and decision making but typically lies outside of the scope of consciousness' (Reber 1989: 16).

While Reber makes a generic distinction between procedural and declarative knowledge as tacit and explicit respectively, this is not the complete picture because some parts of procedural knowledge can be made explicit. For example, in the example no.1 (above) it is possible to have explicit instructions of how to build the TEA laser. This explicit part of procedural knowledge is called propositional or conceptual content (Williams 2001: 140, Gunther 2003). The other part, which is tacit and which is accordingly called non-conceptual or non-propositional content, is not yet well understood because it seems persistently to evade articulation and to lie beyond any norms of declarative knowledge.

Although I have introduced the concept of propositional content in the context of procedural knowledge, it is more commonly associated with experience or perception. This brings us to the third of the recognised categories: knowledge by acquaintance. Knowledge by acquaintance is more often talked about as experiential knowledge, as perceptual knowledge, or as sensual knowledge. The term 'sensual knowledge' is used to connote the unmediated reception of external reality through the senses. 'Perceptual knowledge' is used to connote the reception of external stimuli mediated through human faculties (Maund 2003: 58/59). 'Experiential knowledge' is used in Williams (2001: 69-80) to connote the entirety of both, which is the sense in which I will use it in this paper. However, the notion of experiential knowledge is not uncontentious. Because of its phenomenal nature, experiential knowledge is sometimes disregarded in terms of having a status as knowledge:

> 'Having a headache isn't knowledge though you certainly experience (are acquainted with) the headache; but knowing that you have a headache is. Seeing some colours in your visual field isn't knowledge; but forming concepts from your sensations and recognising that it's an animal stalking in the underbush, is. You couldn't have knowledge without acquaintance, but acquaintance alone is not yet knowledge' (Hospers 1990: 19).

This problem points us back to, and is ameliorated by the idea of propositional content, because like procedural knowledge, experiential knowledge can be associated with displaying propositional and non-propositional content. For example, in the example no.2 (above) one may be able to experience the quality of a certain sound. One may also be able to recognise what one's experience means (non-propositional content) and thus to name it and to describe it (propositional content). However, one may not be able to justify one's experiential knowledge other than through pointing back to one's experience, which means that it is not necessarily possible for others to follow one's judgement, and which may be seen to distinguish it from propositional knowledge. Also, one may not be able to describe one's experiential knowledge adequately with regard to replication (cf. example no.1).

This indicates that the part of experiential knowledge that allows us to make sense of our experience seems elusive to articulation. Equally elusive to articulation is that part of procedural knowledge that allows us to act upon it as we have seen above. Thereby that latter part seems to be based strongly on the former. Further, through the propositional content, both experiential and procedural knowledge seem closely related to propositional knowledge, while propositional knowledge seems to receive its meaning from the experience that tacitly underlies it (Neuweg 2002). For example, written language – as a prevalent means of communication and storing knowledge – is constituted by arbitrary, socially agreed signs, materialised (e.g., with ink on

Continued p. 9 →

paper) which mean nothing until one knows and understands that these signs express concepts and what they mean (Neuweg 2002: 45).

From these considerations, I would like to draw some tentative conclusions on the relationship between the three kinds of knowledge by proposing that experiential knowledge be taken as the basis for the other two kinds of knowledge. In this way, propositional knowledge can be understood as the norms and principles by which to understand experiential knowledge, while procedural knowledge can be understood as experiential knowledge in action. To avoid misunderstanding, I would like to add that this proposition remains firmly rooted in Williams' contextualist framework, and is not a fallback to foundationalist principles, but simply tries to describe in more detail the relationship between the different kinds of knowledge (Figure 1).

5. Tacit Knowledge and Research

Having discussed the nature of, and relational model for the three different kinds of knowledge, we now need to discuss the format of these different kinds of knowledge before we can consider the benefit of this inquiry for design research in terms of the desired inclusion of tacit knowledge within research.

Above, we have seen that propositional knowledge is usually associated with explicit knowledge, while non-propositional (experiential/procedural) knowledge is usually associated with tacit knowledge. However, as we discussed in section 4, there is a tacit component (non-propositional content) to propositional knowledge, which allows it for us to become meaningful, and there is an explicit component (propositional content) to non-propositional knowledge, which allows for its partial communication. This indicates that the notions of explicit and tacit knowledge cannot simply be associated with propositional and non-propositional knowledge respectively, but that these concepts over-

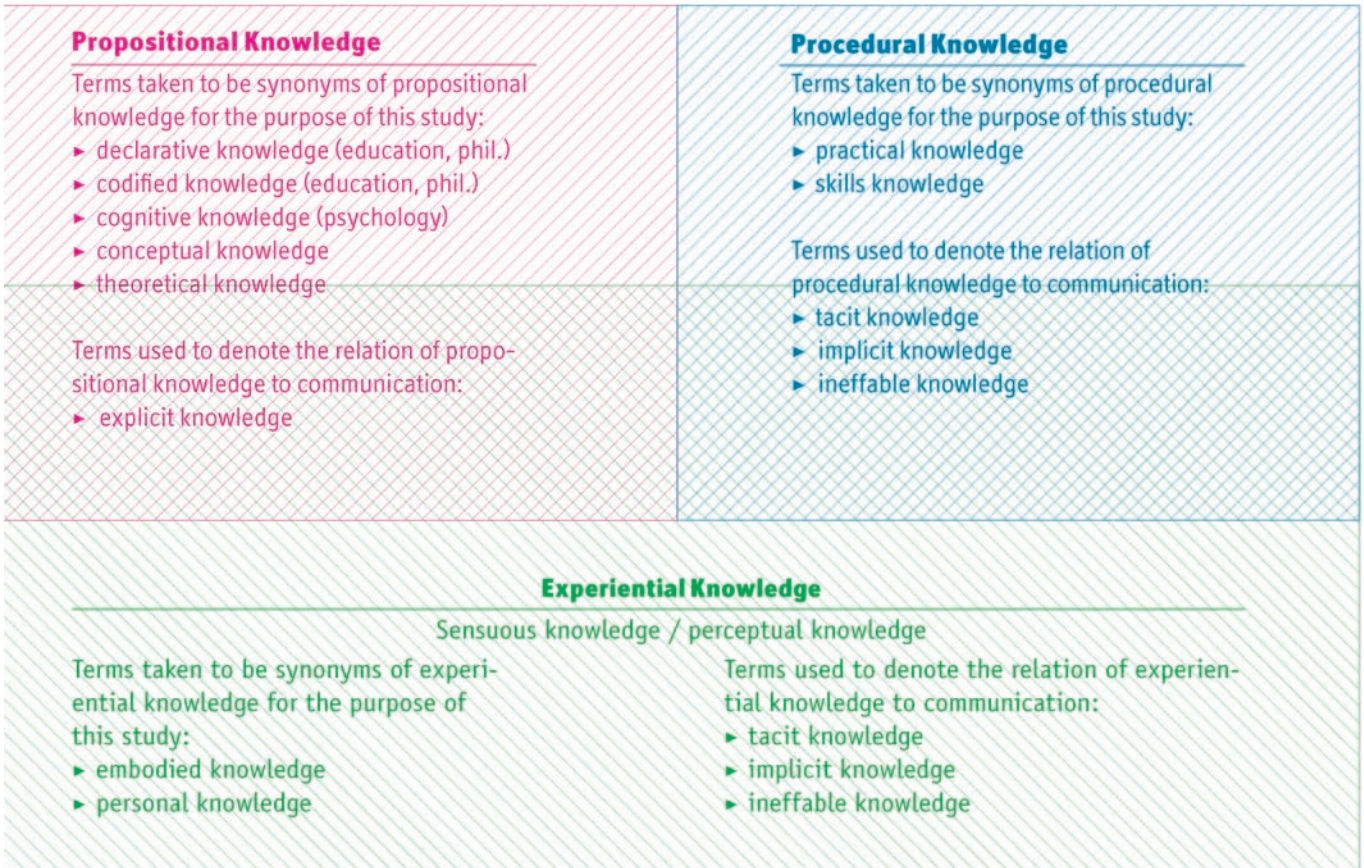


Figure 1: the relationship of propositional, procedural, and experiential knowledge

Continued p. 10

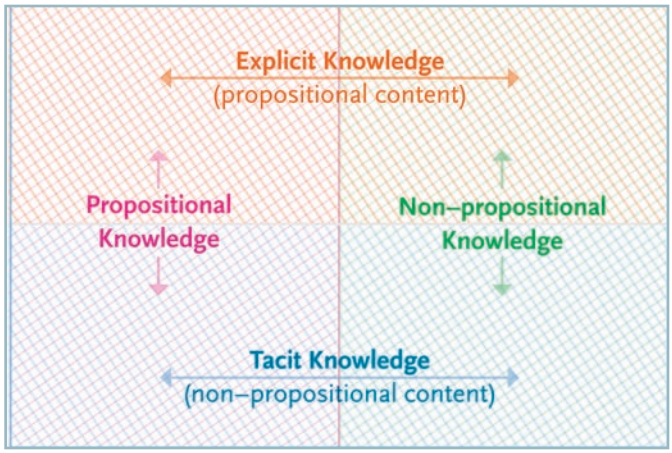


Figure 2: orthogonal relationship of propositional and non-propositional knowledge to explicit and tacit knowledge

lay one another 'orthogonally', and that the concept of explicit and tacit knowledge rather pertains to the notions of propositional and non-propositional content (Figure 2).

In section 2, we have seen that current notions of research are intrinsically related to the notion of propositional knowledge because of matters of logic and communication and that research has no problem with propositional knowledge, because it can be made explicit through verbal means, which adheres to research requirements.

Following our conclusion of the orthogonal relationship between propositional/non-propositional and explicit/tacit knowledge, we can link the notion of propositional content of both propositional and non-propositional knowledge to explicit knowledge, and that of non-propositional content of propositional and non-propositional knowledge to tacit knowledge. Rephrasing the above in this light, this means research has no problem with explicit knowledge or propositional content of knowledge. However, there have been problems with the aspect of tacit knowledge or non-propositional content of knowledge. By its nature, tacit knowledge evades research due to the current requirements of research. On the one hand, tacit knowledge therefore lacks recognition in research, while on the other hand our examples have shown that tacit knowledge is vital both for the development and communication of knowledge in research in design and other CDPs.

Therefore, in the following, it seems important to investigate why non-propositional content remains tacit and thus elusive to research and how one might deal with it. Three questions are worth considering here: i) Why is tacit knowledge tacit? ii) What are the problems with being tacit for research? and iii) How can they be overcome?

i. There are several sources that consider why non-propositional content is tacit. Most prominently, Polanyi (1958: 55) explains it with the concept of focal and subsidiary awareness. A common example is driving a car where one needs to be aware of the road and the way one is going (focal awareness) while operating the car without being conscious all the time of single actions with the pedals, gear-stick etc. (subsidiary awareness). This kind of split awareness has the great benefit that we are able to act, because would we have to be aware of all stimuli and subsidiary actions all of the time, we would not be able to act at all.

ii. If tacit knowledge has this great benefit, we have to consider next what are the problems with it for knowledge creation within research? The main argument why there are problems is that research requires a conscious scrutiny of knowledge for the purpose of verification. While propositional content is open to this scrutiny, because it can be made explicit by verbal means, tacit knowledge seems to evade it. This has raised the question whether the tacit knowledge can be regarded as knowledge at all. If we follow Williams (2001: 175) who argues that we can speak of beliefs as knowledge if they can be verified, we may conclude that tacit knowledge should be regarded as knowledge if we can show that it can be verified. That tacit knowledge can be verified, I would argue, becomes most obvious in relation to procedural knowledge (as knowledge in action) where every action constitutes a judgement over what is right (to do) in every given moment and thus the knowledge is tacitly verified within and through action and its result. We can explain this further if we assume with Williams (2001) that the two content states of knowledge are inseparable (100), and that therefore even where we speak of tacit knowledge, propositional content is involved albeit it has not been made explicit. We can therefore assume experiential and procedural knowledge to adhere to normativity and judgement – even when tacit – and that the judgement can be made explicit 'posthumously' through analysis and explanation. In conclusion, this analysis seems to indicate that there are no intrinsic problems with the understanding and inclusion of tacit knowledge and further of non-propositional knowledge(s) in research as such. Indeed, the

Continued p. 11 →

significance of this holistic understanding of knowledge for CPD research is expressed in Winch's writing (1958), which is summarised by Smeyers (2006: 479):

> 'Winch's position implies that the discussion has to start from a particular social intercourse or 'practice'. It follows that the empirical observa-tional methods (and statistical techniques) cannot possibly be the only yardstick. Instead, the human situat-edness of the phenomena being researched requires that all our observations, arguments, and considerations must be based in our practices. Normative and value-laden elements have to play a crucial role throughout educational research and not just in the first or final stages' (as shown here) (Smeyers 2006: 479).

However, despite this positive assessment there seem to remain some practical problems with the integration and communication of tacit knowledge in research, because of the requirement for the explicit analysis and explanation, (i.e., justification) which is required for example by university regulations and regulations of national research funding bodies in the UK, such as AHRC (2006) and RAE (2005).

iii. The problem with communicating tacit knowledge in research discussed under ii) concerns on the one hand the integration of tacit knowledge into research, and on the other hand it concerns the communication of tacit knowledge that is part of the findings of any research.

Firstly, concerning the inclusion of tacit knowledge in research, designers and other practitioners have taken to e.g., as part of their research in order to be able to draw on the tacit knowledge inherent in their practice. Above, we have discussed that in principle there should not be any problem with the inclusion of tacit knowledge. However, the lack of clarity about knowledge has led to a lack of clarity about how to use practice within research (e.g., Biggs 2002, 2004; Durling et al. 2002). These problems pertain both to research regulations as well as research practice. For example, although research regulations (e.g., AHRC 2006) formally allow practice into the research process, they do not explicitly specify its purpose or role within research. In terms of research practice and methodological conduct, the lack of specification as well as of the understanding of knowledge has led to a loose use of practice within research which in turn has caused problems with the recognition of the validity of using practice as a method and means in research for making tacit knowledge available to the research process.

These considerations suggest that this problematic can be overcome on the one hand by an appropriate framing of practice-led inquiry within research. A very good example is Whiteley's research into the development of artificial limbs through drawing and modelling (Whiteley 2000). They suggest further that, on the other hand, an explicit acknowledgement of the intrinsic importance and role of tacit knowledge in the research process through research regulations and research requirements would be of benefit to research in the creative and practice-led disciplines as well as the provision of clear guidelines of how to do so.

The second problem, which concerns the communication and sharing of tacit knowledge for application in practice, is more profound. Neuweg (2002: 45) sums this problem up in pragmatic terms, declaring that 'although tacit knowledge is not teachable, it is coachable.'

This indicates that there is an intrinsic problem with the communication of research, which has significant consequences for the dissemination of research as well as on research education, and suggests that rethinking these issues is required to progress the identified problems. In particular, this problem will need further research to establish appropriate methods and procedures to overcome the problem. While there have been many approaches to this problem, these are situated in different areas such as knowledge management (e.g., Nonaka and Takeuchi 1995, e.g., Nonaka, et al. 2006), education (e.g.Neuweg 2004), nursing (e.g., Higgs and Titchen 2001), and need analysis and synthesis for application to the problem of research in design.

6. Conclusion and Future Research

This research has investigated the meaning, role and format of knowledge in research and practice, with particular reference to research in the creative and practice-led disciplines. To this end, we discussed that problems with the recognition of tacit knowledge within research have arisen because of the implicit prioritisation of propositional or explicit knowledge in research, and we used some examples to analyse the nature of these problems. We established that tacit knowledge plays an essential role in our ability to obtain highest achievements in practice as well as in research,

Continued p. 12

often expressed as expertise and connoisseurship, and that therefore the deliberate inclusion of tacit knowledge within research is important and necessary.

In order to understand better how to include tacit knowledge within research, (e.g., through the use of practice within research) in sections 3 and 4, we examined the meaning and relationship of the prevalent concepts of knowledge in philosophy. The discussion has sought to clarify the meaning and relationships of prevalent concepts such as propositional and non-propositional knowledge (including experiential and procedural knowledge), propositional and non-propositional content, and explicit and tacit knowledge. Section 5 has used the understanding of knowledge gained in the previous sections to consider knowledge with regard to its format of communication, and with regard of the consequences of this for the role and format of knowledge, in particular tacit knowledge, in research.

We concluded that there is no fundamental problem with including both propositional and non-propositional knowledge in the research process, (e.g., by means of using practice) because non-propositional knowledge, too, has propositional content, which can be made explicit, and by means of which its use can be acknowledged. However, we found that there are problems concerning the communication of the outcomes of research, because the non-propositional/tacit component of knowledge is at least equally important as its explicit counter part for the applicability of any outcomes in practice or in further research, and because tacit knowledge by its nature evades verbalisation and therefore evades communication, dissemination and knowledge sharing.

With regard to methodology and conduct, this research suggests therefore that it would be desirable for future research to analyse and synthesise existing approaches in terms of verbal/textual and non-verbal communication (e.g., description/narrative, examples, models, prototypes, case studies [video] demonstration, coaching, etc.), according to the four categories of knowledge content (propositional content of propositional knowledge, propositional content of non-propositional knowledge, non-propositional content of propositional knowledge, and non-propositional content of non-propositional knowledge). A mapping of this kind would serve to gain a better understanding of any methods and their application within research. With regard to research policy (regulations and requirements), it would be important to acknowledge the existence and importance of non-propositional/tacit knowledge, how it can be included under current requirements, and how research results can be communicated inclusive of its tacit component to facilitate application in practice.

Kristina Niedderer

This paper is to be presented at "Design Inquiries", the second nordic design research conference, Konstfack – University of Art and Design, Stockholm 27-30 May 2007.

Kristina Niedderer

Kristina Niedderer PhD MA(RCA) is a Research Fellow in the Faculty for the Creative and Cultural Industries, University of Hertfordshire, UK, where she is leading the Experiential Knowledge Project and the Experiential Knowledge Conference 2007. She is a design researcher and craft practitioner who was originally apprenticed as a goldsmith and silversmith and worked as a journey (wo)man with Ulla and Martin Kaufmann in Germany. She then trained as a designer and design researcher in the UK, with an MA (RCA) and a PhD in Design.

Her research interests range across conceptual and philosophical issues in craft and design, fundamental principles and practices of using practice within research, the nature and role of knowledge in research and practice; research education, and developing principles for research exhibitions. She has experience of peer review of research quality through conferences and journals, through PhD supervision, and authoring research papers. She has lectured on research issues at various European universities, and is involved in collaborative research networks.

References:

Abidi, S. S. R., Cheah, Y.-N. & Curran, J. (2005). A Knowledge Creation Info-Structure to Acquire and Crystallize the Tacit Knowledge of Health-Care Experts. IEEE Transactions on Information Technology in Biomedicine, 9 (2).

AHRC. (2006). Details of the Research Grants Scheme. Retrieved July 2006, from URL: http://www.ahrc.ac.uk.

Anderson, J. R. (1976). Language, memory, and thought. Hillsdale, NJ: Erlbaum.

Beeston, S. & Higgs, J. (2001). Professional practice: artistry and connoisseurship. In J. Higgs and A. Titchen (eds.), Practice Knowledge & Expertise in the Health Professions. (108-120). Oxford, MA: Butterworth/ Heinemann.

Biggs, M. A. R. (2002). The Rôle of the Artefact in Art and Design Research. International Journal of Design Sciences and Technology, 10 (2), 19-24.

Biggs, M. A. R. (2004). Learning from Experience: approaches to the experiential component of practice-based research. In H. Karlsson (ed.) Forskning-Reflektion-Utveckling. (6-21). Stockholm: Swedish Research Council. Online at URL: http://www.herts.ac.uk/artdes/research/tvad/mb/2004a.pdf.

Berliner, D. (1994). Teacher Expertise. In B. Moon and A. S. Hayes (eds.), Teaching and Learning in the Secondary School. (107-113). Routledge.

BonJour, L. (2001). Epistemological Problems of Perception. Stanford Encyclopedia of Philosophy (Online). Retrieved February 2006, from URL: http://plato.stanford.edu/.

Collins, H.M. (1985). Changing Order. Replication and Induction in Scientific Practice. London: Sage.

Crane, T. (2005). The Problem of Perception. Stanford Encyclopedia of Philosophy (Online). January 2006, from URL: http://plato.stanford.edu/.

Dreyfus, H. L. & Dreyfus, S. (1988). Mind over Machine: the power of human intuition and expertise in the era of the computer. New York: Free Press.

Continued p. 13

Mapping the Meaning ... continued from p. 12

Durling, D., Friedman, K. & Gutherson, P. (2002). Editorial: Debating the Practice-Based PhD. International Journal of Design Science and Technology, 10 (2), 7–18.
Eraut, M. (2003). The many Meanings of Theory and Practice. Learning in Health and Social Care, 2 (2), 61–65.
Grayling, A. C. (2003). Epistemology. In N. Bunnin and E. P. Tsui-James (eds.), The Blackwell Companion to Philosophy. (37-60). Oxford, UK: Blackwell Publishing.
Gunther, Y. H. (ed.) (2003). Essays on Nonconceptual Content. Cambridge (MA) and London (UK): MIT Press.
Herbig, B., Büssing, A. & Ewert, T. (2001). The Role of Tacit Knowledge in the Work Context of Nursing. Journal of Advanced Nursing, 34 (5), 687-695.
Higgs, J. & Titchen, A. (1995). The Nature, Generation and Verification of Knowledge. Physiotherapy, 81 (9), 521 - 530.
Higgs, J. & Titchen, A. (eds.) (2001). Practice Knowledge & Expertise in the Health Professions. Oxford, MA: Butterworth/Heinemann.
Hospers, J. (1990). An Introduction to Philosophical Analysis. London: Routledge.
Maund, B. (2003). Perception. Chesham, UK: Acumen.
Miles, M., Melton, D., Ridges, M. & Harrell, C. (2005). The Benefits of Experiential Learning in Manufacturing Education. Journal of Engineering Technology, 22 (1), 24-29.
Neuweg, G. H. (2002). On Knowing and Learning: Lessons from Michael Polanyi and Gilbert Ryle. Appraisal, 4 (1), 41-48.
Neuweg, G. H. (2004). Könnerschaft und implizites Wissen. Münster and New York: Waxmann.
Niedderer, K. (2007). Analysing the Meaning of Knowledge in the Definition of Research. European Academy of Design Conference 2007. Izmir, Turkey.
Niedderer, K. (2006). Reviewing the Understanding of Experiential Knowledge in Research in Art & Design (Working Paper). Experiential Knowledge Project. URL: http://www.herts.ac.uk/artdes1/research/tvad/ekp.html
Niedderer, K. (2005/2007). Process and Product in Doctoral Research. Perspectives: AHRC Collaborative Doctoral Training. Coventry University UK, 30/05/2005. (Seminar presentation, unpublished) - Publication forthcoming under the title: Practice in the Process of Doctoral Research. In theory? DeMontfort University, Leister, 2007.
Nonaka, I., Krogh, G. v. & Voelpel, S. C. (2006). Organizational knowledge creation theory: Evolutionary paths and future advances. Organization Studies, 27 (8), 1179-1208.
Nonaka, I. & Takeuchi, H. (1995). The Knowledge-Creating Company. Oxford, UK: Oxford University Press.
Polanyi, M. (1958). Personal Knowledge. London: Routledge & Kegan Paul.
RAE. (2005). RAE 2008: Guidance on Submissions. from URL: http://www.rae2008.ac.uk.
Reber, A. (1989). Implicit Learning and Tacit Knowledge. Oxford and New York: Oxford University Press.
Refsum, G. (2002). Bête comme un peintre? Working Papers in Art & Design. Accessed February 2006, from URL:http://www.herts.ac.uk/artdes1/research/res2prac/confhome.html.
Smeyers, P. (2006). 'What it Makes Sense to Say': Education, Philosophy, and Peter Winch on Social Science. Journal of Philosophy of Education, 40 (4), 463-485.