A DISCOURSE ON THE MEANING OF KNOWLEDGE IN ART AND DESIGN RESEARCH

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Abstract
This paper discusses the problem of knowledge in research in the creative and practice-led disciplines as it appears in the UK.[1] The purpose is to clarify the role and inclusion of practice within research in relation to the requirement for making a contribution to knowledge. The paper begins by introducing the problem of knowledge in research. It then examines what kind and format of knowledge is currently formally accepted in research, and compares the result with examples of knowledge generated by research in art and design. This serves to reveal where there are gaps and contradictions between current understandings of research (research policy) and evident needs of research practice. In the conclusion, suggestions for possible future developments and research are made.

1) Introduction

One of the core requirements of research is the original 'contribution to knowledge'.[2] An 'original contribution' in this context means an addition to knowledge that is new – not just for one person (e.g. the researcher) but altogether for the field. Originality is usually demonstrated through the literature review which provides a survey over relevant existing knowledge in the field (Langrish 2000). What 'knowledge' means in this context is, however, less well defined. Its meaning seems mostly taken for granted, which proves problematic upon closer examination.

For example, problems have arisen with the conventional understanding of knowledge in research in the context of creative and practice-led disciplines, which commonly use practice as part of their research in order to gain new knowledge of existing practice (process or product), to develop new processes and skills, or to develop new objects (products). These problems concern the requirement of explicit communication of knowledge as well as its application and use, because part of the knowledge of practice-led disciplines is experience-based and therefore difficult to communicate through conventional language-based means of research.

To illustrate the problem, we might think of a craftsperson whose mastery of a particular technique leads to original results and new knowledge. However, the

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[1] With 'creative and practice-led disciplines' we include for example, art and design; music, film and media; education; knowledge management; health, nursing, physiotherapy, etc. These disciplines share problems with the generation and communication of knowledge through research, and its application in practice, i.e. with the dichotomy of explicit and tacit knowledge. For our investigation, we use examples from art and design in the UK. However, we hope we have developed the research on a sufficiently generic level so that it is transferable to other creative and practice-led disciplines.

[2] One exception to be mentioned is the professional doctorate which requires a 'original contribution to practice', although the difference to a 'contribution to knowledge' is not quite clear either. Usually, it refers to the strongly clinical nature of the professional doctorate, making its findings less generalisable than those of the PhD.

know-how of the mastery might be beyond verbal articulation, and so might be the knowledge or understanding gained from the use or experience of the new results (e.g. artefacts, etc.). This example raises questions about the different nature or format of knowledge sought in different research contexts, about where and how the knowledge is contained, and how it can be communicated, e.g. by textual or creative output. Uncertainties about the answers to these questions have led to problems with the conduct of research in the creative and practice-led disciplines and have revealed a disparity between research requirements and the evident needs of research practice in design to produce results that benefit professional practice and academy alike.

The purpose of this paper therefore is to address the question of the nature and format of knowledge sought in research. The paper begins by examining some UK definitions of research from the creative disciplines. It analyses what the current requirements of knowledge are in their context and where there are disjunctions with apparent needs in research and practice. It further analyses the current nature of research through comparison with philosophical concepts of knowledge. From this we conclude on the current understanding of the nature of knowledge in research, on what its shortcomings are, and on how it might be developed to accommodate the identified needs.

2) The requirement of knowledge in definitions of research

We find the requirement for a contribution to knowledge at the centre of many of the definitions of research that are provided by funding agencies and by university regulations in the UK. For example, the definition of research for the RAE (2005) explains that

'Research' for the purpose of the RAE is to be understood as original investigation undertaken *in order to gain knowledge and understanding*. It includes work of direct relevance to the needs of commerce, industry, and to the public and voluntary sectors; scholarship […]; the invention and generation of ideas, images, performances, artefacts including design, where these lead to new or substantially improved insights; and the use of existing knowledge in experimental development to produce new or substantially improved materials, devices, products and processes, including design and construction. It excludes routine testing and **routine** analysis of materials, components and processes such as for the maintenance of national standards, as distinct from the development of new analytical techniques. It also excludes the development of teaching materials that do not embody original research.

and the guidelines of the AHRC (2005) state that

- it must define a series of research questions or problems that will be addressed in the course of the research. It must also *define its objectives in terms of seeking to enhance knowledge and understanding* relating to the questions or problems to be addressed
- it must specify a research context for the questions or problems to be addressed. You must specify why it is important that these particular questions or problems should be addressed; what other research is being or has been conducted in this area; and *what particular contribution this project will make to the advancement of creativity, insights, knowledge and understanding* in this area

- it must specify the research methods for addressing and answering the research questions or problems. You must state how, in the course of the research project, you will seek to answer the questions, or *advance available knowledge and understanding* of the problems. You should also explain the rationale for your chosen research methods and why you think they provide the most appropriate means by which to answer the research questions.

Further, University regulations e.g. of Plymouth University and of the University of Hertfordshire state respectively that

> The degree of Ph.D. should *include a distinct contribution to the current knowledge* of the subject. The thesis should show systematic study and independent, critical and original powers and should be capable of publication in whole or in part. (Plymouth 2003/4)

and that

> A candidate for the award of PhD shall have undertaken a substantial programme of individual research, involving the sustained exercise of independent critical powers including the ability to use research outcomes to guide the development of the research programme, and *leading to a significant original contribution to knowledge or its interpretation.*
> The candidate shall present the results of the research in a submission, embodying a thesis presented and defended in a lucid and scholarly manner, and containing material worthy of peer-reviewed publication.
> The candidate shall demonstrate technical competence in the chosen field, including appropriate knowledge and use of research methods and of a substantial body of other relevant work, and an appreciation of the context and significance of the thesis.(Hertfordshire 2006)

All four definitions emphasise the contribution to knowledge as a main requirement of the outcome of research. However, while these regulations go on to set out further formal requirements for the conduct of research, they remain silent about what knowledge and understanding means in the context of their specifications. For example, the AHRC definition emphasises on explicatory and analytical documentation of research (see also Biggs 2002), in particular where practice is part of research:

> This definition of research provides a distinction between research and practice *per se.* Creative output can be produced, or practice undertaken, as an integral part of a research process […] The Council would expect, however, this practice to be accompanied by some form of documentation of the research process, as well as some form of textual analysis or explanation to support its position and to demonstrate critical reflection. Equally, creativity or practice may involve no such process at all, in which case they would be ineligible for funding from the Council. (AHRC 2005)

Tacitly implied in this addition is that the documentation has the purpose of explicating the original contribution to knowledge. Further, the requirement for textual analysis/documentation seems to indicate that the contribution to knowledge can (only) be explained and communicated by textual means. However, this leaves the role of the creative process/output with regard to the generation and communication of knowledge largely undefined.

One finds a similar lack of clarity in regulations for PhDs, in particular where the integration of creative practice is concerned. In their review of *Doctoral Study in Contemporary Higher Education*, Green and Powell (2005: 100-118) explain that most of the university regulations that offer explicit rules for practice-based research degrees permit submission of creative practice in conjunction with a written piece (thesis, exegesis) of variable length for a research degree. As with the AHRC definition, the problem is that while they specify the formal relationship between practical and written work, they remain silent about the intrinsic relationship of the two, i.e. about how the two parts relate with regard to the embodiment and communication of knowledge.

Green and Powell recognise the dilemma that this lack of specification creates for the understanding of practice-based PhDs and point out that there is as yet no national consensus about the regulations and conduct for them (103). Besides the most common practice of submitting creative work together with a thesis, the debate is still ongoing (and manifest in some Universities' regulations) as to whether

> a Practice-Based Doctorate can be awarded solely on the basis of the production of creative work(s) – assessed by knowledgeable peers who are experienced in the field and who can therefore pass judgement on whether or not the work(s) is worthy of note as excellent in respect of the criteria operating in that field and as contributing to knowledge itself. (103)

Whether or not the creative work submitted for a practice-based PhD has to be of professional excellence may be arguable, while it seems to be commonly accepted by now that the original contribution to knowledge is an essential criterion for awarding a PhD, including a practice-based PhD. However, it remains unresolved in which format this knowledge is to be presented, and which role practice has concerning its embodiment and communication.

Tracing the problem about the embodiment and communication of knowledge further, we find that it may have its foundation in another problem. Green and Powell (2005: 101) consider that "the PhD is a generic award made for contribution to knowledge… whatever the nature of that knowledge". Their statement is of significance because it implies that there may be different kinds of knowledge, which may require different modes of embodiment and of communication of knowledge. Clarifying the nature of knowledge in the context of research therefore may hold the key to answering all subsequent questions concerning the embodiment and communication of knowledge in research in the creative and practice-led disciplines.

3) Reviewing the meaning of knowledge in the definition of research

The above discussion has shown that the understanding of knowledge in the definition of research has been left undefined. It seems obvious to conclude that the definition therefore should accommodate all relevant forms and meanings of knowledge. However, the discussion of research regulations (§2) has indicated problems and uncertainties in practice-led disciplines concerning the inclusion of certain formats of knowledge as research contribution, which contradict this conclusion.

In answer to this contradiction, our conjecture is that it only appears that the meaning of knowledge is not defined and that the definition of research really refers to, and prioritises, what is known as explicit or propositional knowledge. It is not immediately

recognisable that the definition of research prioritises propositional knowledge because the meaning of knowledge is not explicitly specified in the definitions of research but rather it is qualified implicitly through related requirements. This becomes apparent when analysing the formal requirements of research concerning accepted formats of presentation of the knowledge contribution. In the following, we therefore investigate these formal requirements and how they pertain to propositional knowledge.

There are a number of additional requirements in the definitions of research that further specify the central requirement for a (original) contribution to knowledge as an outcome of research, qualifying its character and format. For example, regulations of both the AHRC and of the University of Hertfordshire require a written document as part of the outcome of their research, the purpose of which is to provide a critical reflection or thesis:

> The Council would expect […] practice to be accompanied by some form of documentation of the research process [containing research questions, methods, and context], as well as some form of textual analysis or explanation to support its position and to demonstrate critical reflection (AHRC 2005),

The University of Hertfordshire makes the following requirement concerning the submission of a PhD, MPhil, or MA/MSc by research:

> A submission must contain a written document that presents and defends a thesis… A thesis is an intellectual position capable of being maintained by argument. A submission may also contain other works on which the thesis and its defence are based (Research Degrees Handbook 2004 Regs Page A6, University of Hertfordshire).

The requirement for *textual/written presentation* implies the requirement for explicit communication, e.g. of research question/problem, objectives, context, and method, and is also consistent with requirements for *dissemination* in order to share the knowledge that constitutes the research findings. The analytical character of language allows eliciting one specific meaning of any particular issue and thus facilitates unambiguous communication (Niedderer 2004b), which is essential for *maintaining the intellectual position* (thesis, proposition) that is required of research. The proposition or thesis is to be *defended by an argument*. The argument has a certain logical structure in which the proposition is substantiated through evidence-based reasoning, and which sets out why or why not the proposition should be believed to be true. The outcome of the research, showing whether the proposition could be sustained or whether it was refuted and why, is usually seen as the core of the contribution to knowledge. Examples for this on different levels of inquiry might be

Proposition 1: "The use of laser-welding technology can offer new (technical, aesthetic, etc.) opportunities for goldsmithing and silversmithing." – The argument would have to identify and demonstrate through evidence what opportunities there are and that previous technologies did not offer these opportunities. – The contribution to knowledge would accordingly be the knowledge of these new opportunities and how they can be realised through laser-welding technology.

Proposition 2: "There is a new category of design object." – The argument has to identify the characteristics of this category of objects, and it has to demonstrate that (at least theoretically) such objects can exist and that they are different to other

categories of design object. – The contribution to knowledge would accordingly be the new knowledge of the existence of a certain category of design object.

A further requirement, asking for a *significant* contribution, implies that the result should not just be relevant for the one specific case, but that the research should elicit something generic about the phenomenon in question, such as characteristics or principles. For this reason, when talking about propositions, we commonly think about them as linguistic constructions (although language is no absolute requirement for making a proposition, Biggs 2002). This is because language offers the potential for abstraction because of its representative character which allows extracting and detaching relevant aspects from a specific situation, case, etc. and thus make them *transferable and/or generalisable.*

The above explanations and examples imply a certain philosophical position, which is closely linked to the grammar and logic of language, and which shape the logic of a thesis, its argument and its evidence-base. This position determines what is a valid argument, and what is a valid and rigorous methodology in its context, i.e. use of methods to gain evidence. Our conjecture is therefore that this position is the position of propositional knowledge as we shall see in the following.

4) The characteristics of propositional knowledge and its prioritisation in research

In this section, we discuss what we mean by propositional knowledge and how the requirements imply and pertain to propositional knowledge. We begin by introducing the idea and characteristics of propositional knowledge with a brief introduction of knowledge in philosophy (epistemology).

Two of the main concerns of epistemology are the questions 'What is knowledge?' and 'How do we know?' There is a long history of investigating these two questions with different results. During the 20th century, there has been much debate about whether we can define what knowledge is. The definition of knowledge as "justified true belief" is the definition that has probably received the most widespread consent, although it has also been challenged (Grayling 2003). The definition of knowledge as 'justified true belief' needs explaining, before considering the challenges that have been mounted. 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.

Grayling (2003: 39) explains further that this definition of knowledge "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)), and that it is the kind of knowledge that has predominantly occupied philosophy. One might therefore add to the definition that knowledge is the *justified true belief of a proposition*.

However, in 1963, Gettier raised objections against this definition of propositional knowledge, which led to the request for a fourth as yet unknown condition to

establish "justified true belief" as the definition of knowledge or, alternatively, for a completely new definition of knowledge (Hospers 1990; Pollock and Cruz 1999; Grayling 2003). Gettier's objection was that no causal link can be shown between what is taken to be 'true belief' and the 'justification' for it. There are also other problems with the third condition of knowledge, i.e. with justification. Hospers (1990) gives several examples, of which I shall introduce the last, because of its consequence for the further argument:

> There is yet another kind of objection to the third condition of the standard definition of knowing. Knowing p requires having evidence for p; let us say that this evidence is another proposition, q. But don't we then have to know that q is true? If I don't know that q is true, how can q be good evidence for p? And how do we know q? Perhaps by another proposition r. And so on – it seems that we are caught in an infinite regress. The requirement of evidence always takes us beyond the original proposition, p, to another one, and then we have to know the truth of that one in order to know the truth of the original one. (Hospers 1990: 30)

In order to manage this infinite regress, philosophers have put forward two different ideas. One idea is that

> we don't really know *any* of them [i.e. the propositions] in isolation, but that p,q,r and others simply lend support to one another, and each one of them makes the other more probable. (Hospers 1990: 30)

The other idea is that there are propositions that are foundational in the sense that they are self-evident and therefore need no further evidence. For example, someone might say that they feel tired. If asked how they know this, there would be no further explanation than that they have the experience of feeling tired.

We find that both these ideas are accepted (within limitations) for obvious pragmatic reasons. This pragmatic stance is further justified by the consideration how we can know that we don't have any knowledge. Because, if we cannot have knowledge of anything, it follows that we cannot know either that we have no knowledge. This leads into a circularity that means that we can neither prove nor disprove whether we have knowledge. It is therefore useful to accept the two ways that are currently available to justify true belief as knowledge. We can find the acceptance of these two principles also in research, which allows us to conclude that the research contribution implicitly refers to propositional knowledge. In summary, research requirements and regulations pertain to propositional knowledge in the following ways:

- Firstly, research requires a thesis or *proposition* to be put forward. Drawing on Frege and Russell himself, Wittgenstein was most influential in shaping the understanding of what a proposition is (Kenny 1973/2006: 54). In his sense, a proposition may be understood as a sentence or thought that is the representation (or abstract 'picture') of reality (or 'fact'). This reality or fact may be represented through language. Because it is a representation, a proposition can be true or false and may receive its verification through comparison with reality, i.e. through the research requirement for evidence-based reasoning.
- Secondly, research requires this proposition to be defended by an *argument*, which serves to demonstrate that our 'belief' (proposition) can justifiably said to be 'true'.
- Thirdly, research requires this argument to be substantiated through *evidence-based reasoning*, which is based on either or both of the principles

discussed above, i.e. either on a coherent set of propositions that all support each other and therefore plausibly support the argument, and/or on facts/propositions that are self-evident (e.g. I feel tired and therefore I know I am tired; an experiment which demonstrates any given proposition).

For these reasons, we can justifiably assume a prioritisation of propositional knowledge, including the prioritisation of language within research.[3] On this basis, it seems perfectly adequate to include practice in research as form of evidence in support of theoretical, linguistically communicated outcomes. However, current research practice shows that many practitioner-researchers feel dissatisfied with this prioritisation. On the one hand, there is the perception that it is difficult to communicate the knowledge that practitioners have in the required way. On the other hand, there are concerns that the form of knowledge produced by research is difficult to absorb and apply, because parts of the knowledge essential for application are missing. In the following section, we shall analyse what the problems of creative and practice-led disciplines are with the prioritisation of propositional knowledge.

5) Problems with propositional knowledge in creative and practice-led research

This section examines problems with the prioritisation of propositional knowledge in the creative and practice-led disciplines in order to identify potential avenues for solving them. The main indicator for the problems at hand seems to be the wish of practitioner-researchers to use practice within research. Related to this symptom is a frequent uncertainty of practitioner-researchers about the role of practice in the context of research, about how to relate theoretical and practical work and fit it within existing research regulations. This uncertainty, which has been briefly discussed above, has been a reoccurring theme (Durling et al. 2002), which has been reflected in educational research papers such as that by Langrish (2000) who has addressed this uncertainty on a pragmatic level within the conventional understanding of research. However, since the wish to use practice within research as well as the uncertainties about it persist, the question arises why practitioners feel the need to use practice within research and why it remains problematic.

The reason for *practice being used in research* in the creative disciplines (and related inquiries) is that it creates the object of inquiry in the sense that the research is either concerned with the process of creative practice or it investigates its results. Scharmer (2000) talks about embodied and not-yet-embodied knowledge to denote that in some disciplines new realities (e.g. artefacts, processes, services etc.) and with them new knowledge is created. The creative use of research for developing a new reality is quite unlike the understanding of traditional (scientific) research in that it investigates *what could be* rather than *what is* (Niedderer 2004a: 26). Researchers in the creative disciplines have also used creative practice in research in order to achieve the inclusion of tacit knowledge gained in practice, such as skills, an intuitive grasp of the state of the art of a field, or expert judgement.

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[3] Because of its link to language, in much of the research literature, propositional knowledge is also referred to as explicit knowledge. However, this is not necessarily accurate, because on the one hand propositional knowledge has a tacit component, which lays e.g. in extracting the meaning of the proposition from the words that make up the propositional sentence. On the other hand there are parts of so-called tacit knowledge (or experiential or non-propositional knowledge) that can indeed be put into words, such as certain instructions how to do a certain task. To clarify the meaning and relationship of these different terms will be the task of forthcoming research.

The use of practice in research can therefore be seen to serve two purposes: firstly to facilitate the inclusion of existing personal/tacit knowledge in research; and secondly, to facilitate the creation and communication of new knowledge. Concerning the former, although there does not seem to be any intrinsic problems with using practice within research (Niedderer 2007), problems have occurred in the past with the use of creative inquiry in terms of validity because of the understanding of creative inquiry

as an emergent and unsystematic process, while research is aimed at being a systematic inquiry. Recent examples of research inquiry using creative practice (e.g. Whiteley 2000; Niedderer 2004a) have demonstrated that the problem of validity can be overcome if the creative part of the inquiry is appropriately framed and integrated into the research process. The second problem concerning the role of practice in the creation and communication of knowledge in research is more complex. It has two aspects. One is the communication of advancement in process knowledge; the other is the communication of knowledge related to the products of practice as research outcomes.

Beginning with the latter, the reason for *presenting practice as a result of research*, traditionally, is its use as evidence, with the outcomes of practice being presented supplementary to a critical exegesis, report, etc. which presents the research process and contribution to knowledge. This is coherent with our earlier developed understanding of research as presenting the defence of a proposition, i.e. of a representation, which can be true or false, and which may receive its verification through comparison with reality, e.g. the outcomes of practice in form of an artefact. The presentation of practice as evidence raises the question as to why we should need both text and practice because one could argue that, if the proposition is a representation of the practice, the central meaning of the proposition must be contained within the object and that therefore the presentation of practice alone should suffice. For example, if the proposition about a green ball is that "the ball is green", will not the ball tell me the same if the proposition is true? Although this is correct, when presented with the ball alone, I have no means to determine whether not the proposition is 'the ball is round'. This example suggests firstly that the same knowledge is contained in the practice/artefact and the proposition and that we are not dealing with two different kinds of knowledge but rather with two different formats of knowledge, which is supported by research into tacit knowledge by Neuweg (2004). Secondly, the example shows that the analytical character of language is important for unambiguous communication. In this context, Biggs (2002: 24) has suggested that it might be possible to present an argument by non-linguistic means, but that the challenge is to achieve contextualisation by non-linguistic means to explain the research, and that this challenge has as yet not been met.

While these considerations defend the prioritisation of language in the communication of the contribution to knowledge, in recent years, there have been examples of using practice within research in which practice seems to provide more than just evidence, i.e. that show that it can provide an enriched knowledge that cannot be verbalised. For example, Whiteley (Rust and Whiteley 1998) has developed "a mechanical analogy for the human skeletal arm to inform the future development of prostheses and other artefacts" (Rust et al. 2000: 1) through drawing and modelling. Both the investigation and the communication of the findings in this case were dependent on the drawings and models, which provided not only the (propositional) knowledge of an improved articulated prosthesis (knowing that), but also provided experiential knowledge of how such a prosthesis might be constructed and work. This means the drawings and models additionally provided the understanding that is needed to apply the knowledge gained in practice. This example demonstrates the importance that creative practice can have for

communicating tacit knowledge as part of research, and it seems that it would be useful to recognise this importance formally in the requirements and logic of research.

The communication of the contribution of research using practice is more problematic *where the research is concerned with process.* For example, we can imagine a researcher writing down the findings and knowledge that they have gained from their research into a certain process, and that they describe both process and outcome as accurately as possible so that anyone can inform themselves about the research. According to the conventional understanding of research, we should expect anyone to being able to repeat the process and arrive at the same results. That this is not the case is demonstrated in the following example where a Canadian Research Laboratory successfully built a so-called TEA-laser. British attempts to replicate the laser on the basis of written information 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 (Neuweg 2002: 42). Examples such as this demonstrate that it is often difficult to communicate the knowledge that practitioners have in the way that is required of research. Practitioners from a wide range of subjects have therefore voiced concerns that an important part of tacit knowledge that is contained within practice is at risk of being overlooked and omitted in the conventional communication of research (e.g. Higgs and Titchen 1995; e.g. Rolfe 1996; Neuweg 2002), because of the limitations of language, and because the research process and the knowledge that is its outcome currently seem to be dissociated in the final presentation of results. As a result, the research outcome currently only distils what can (and is intended to) be made explicit by the researcher while much of the tacit knowledge inherent in the research remains unacknowledged (Neuweg 2002; Eraut 2003; Biggs 2004). However, this omitted part is highly important for practitioners, because it facilitates both understanding and applicability of any explicit knowledge.

The above indicates that the problem is not a problem with the use of practice within research as such, but with the communication of experiential or tacit knowledge (including perceptual and procedural knowledge) gained from its processes with regard to application. This makes the problem an educational problem, which I suggest can be approached in two ways.

Firstly, the problem can be seen as an organizational problem. If we accept that experiential knowledge can only be partially communicated by language, and if we look around how people have dealt with the communication of experiential knowledge so far, we find that the most common way of communication is through observation and imitation, as we find it e.g. in apprenticeship systems or in mentoring schemes (Friedman 1997). Although this kind of communication system is mirrored in the system of doctoral supervision, which therefore sometimes is called an 'apprenticeship in research', this system has not been widely applied to the communication of research outcomes. The reason for this may partly be the labor-intensive nature of this kind of tutoring, which is contrary to the aim of wide dissemination. Partly, it may be simply that there are not that many researcher-practitioners yet, e.g. in art and design. Nevertheless, the integration of research result through practice-related workshops etc. could be increased and thus the effectiveness of research communication.

Secondly the problem can be seen as a problem of knowledge communication, which raises the question whether the elusive part of experiential knowledge can be communicated directly, or whether it has to be communicated indirectly via so-called 'knowledge conversion'. Direct communication might, for example, be achieved

through the use of new media, which would attempt to transmit the experience of the teacher in the same experiential form to the learner. One might imagine here the use of new technologies that might allow the transfer of an experiential stimulus to the learner through electronic devices, rather than the communication through conventional means of observation and imitation, which seem less precise. This option is not yet available, but might be a future option since it is being tested in various forms, most prominently by the artist *Stelarc* (1996)*.* Therefore the indirect approach of 'knowledge conversion', which is closely related to the organisational approach, might be the more realistic option, at least for the time being. The most prominent model of knowledge conversion has been developed by Nonaka and Takeuchi (1995, 2006) in the context of knowledge management as a pragmatic means of bridging the gap between explicit and tacit knowledge. They propose a four-stage-model of knowledge conversion for the purpose of sharing experiential (tacit) knowledge, which covers all possible constellations of knowledge transfer, i.e. for tacit to explicit, from explicit to explicit (usual form of research communication), from explicit to tacit (application), and from tacit to tacit (ix). They further discuss different techniques for managing each transfer-form. The application of the model to managing the communication process in research in the creative disciplines therefore seems a promising avenue and will be the subject of forthcoming research.

6) Conclusion

In this paper, we have examined the notion of knowledge in research. By analysing definitions of research, we found that the understanding of the term 'knowledge' in the definition of research is not explicitly defined. Through analysis of related research requirements and their comparison with the characteristics of propositional knowledge, we could show that the 'knowledge' in the definition of research is implicitly determined as both explicit and propositional knowledge, which has come to mean communication by verbal means. We have further investigated the consequences of this understanding of knowledge in research for research practice in the creative and practice-led disciplines.

We have been able to show that some of the uncertainties and problems of current research practice are caused by this implicit understanding of knowledge. However, the problem does not seem to be a problem with the use of practice within research as such, but a problem with the communication of the knowledge gained from the research, especially where process knowledge is concerned, because the language-based prioritisation of propositional knowledge excludes (some part of) experiential knowledge which cannot be communicated by verbal means and which is essential for the application and use of any knowledge. In due course, we have identified the problem of communication as an educational problem, which can variously be regarded as a problem of organisational or of communicational nature, and for which relevant avenues for future investigation have been identified in §5.

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