

IMPLICIT KNOWLEDGE IN CONSTRUCTION PROFESSIONAL PRACTICE

David Boyd¹ and David Pierce²

¹ School of Property and Construction, University of Central England, Birmingham, UK

² Construction Department, Southern Polytechnic State University, Marietta, GA, USA

In educating for construction or in researching construction, it is necessary to have a deep understanding of how the industry operates. However, there is very limited information available on what construction professionals actually do in practice. What is written about is what should be done. From this there is an assumption that we do know or it is irrelevant, as we should do what the literature says should be done. This literature and assumptions rest on expertise based on the explicit technical task and process knowledge. This paper reports on a study that challenges these assumptions and is seeking to find a more relevant and useful perception of practice. The study is based on interviews with senior practitioners in the UK and the USA to determine their practice and how it has developed. Results are presented which identify the practitioner's use of a high degree of implicit knowledge that cannot be explained. In addition, their personal outlook influences their approach to the task. One location of this more extensive knowledge is in notions of teamwork which has only just been added tangentially to the technical expertise. A more holistic model is suggested which integrates the extensive implicit knowledge with technical expertise and the individual's personality.

Keywords: construction practice, tacit knowledge, implicit knowledge, education, research

INTRODUCTION

This paper is based on research that is seeking a better approach to teaching construction management. In both the USA and UK, there has been criticism of academia for not adequately educating for practice (Business Round Table 1982, Andrews and Derbyshire 1993, Anderson 1992). Indeed some of the industries wider problems have been blamed on education (Latham 1994). In the USA this has caused the American Council for Construction Education to rewrite its curriculum ACCE (1995). In the UK, it has given rise to new concepts of practice education based on testable competencies with NVQs and now national benchmarks, which are soon to prescribe the nature of education.

Construction courses have been in existence for many years. These have been substantively of a technical nature. There was a belief in the sixties that an understanding of the science behind practice would enable practitioners to perceive, devise solutions and act in practice more effectively. This idea meant that research into practice involved finding out how the parts worked in more and more detail. This information would then be transferred to student practitioners in formal lectures or texts by people who were investigating these parts. Franklin (1992) explained this thinking "It is the strength of the scientific method that it provides a way to derive the general from the particular and then, in turn, allows general rules and laws to be

applied to a particular question”. Such thinking is still wide spread and is the constitution of many construction courses. However, there have been many dissenters. Franklin (1992) states with a sense of warning that “Consequently, somebody can today go to a University and learn how to build bridges from someone who has never built a bridge”. Simon (1969) called for a new imperative logic for practice based on wholes.

This debate is still there but more behind the scenes. It is probably the case that many of the best Schools still have a preponderance of scientific-research orientated academics whereas less renowned Schools tend to have practitioners who saw their experience of practice as being sufficient to teach practitioners. We do not believe it is an either or situation in fact neither approach may be successful. We share something of Franklin (1992) concerns about scientific thinking: “there has been a very marked decrease in the reliance of people on their own experience and on their own senses. All sense including the so aptly named common sense is perfectible and it is a great pity that we have so little trust in them”. The real problem is that we do not know.

However we believe as practitioners, and are often told as educators, that practice is more than we can teach or what is learnt at college. We as clients also do not trust that novice practitioners can meet our needs; somehow it is the experienced practitioners that commands our respect; we are even willing to pay them more. The question is what do they have which is different from the novice. Is it a greater quantity of knowledge as the technical/ scientific based courses would have us believe? Or is it that they have acquired some special knowledge because they have experienced more situations therefore they can perform and have confidence of this performance in more situations?

Currently, teaching and research assumes that we know exactly what practitioners do; indeed we could not teach it or improve it if this was not the case. Considering any construction management text we have found none that acknowledges that we do not know or cannot express what a practitioner does. Such texts clearly lay out what should be done in an explicit and logical manner. There are still technical texts which see the construction world as materials and plant which can be programmed perfectly into efficient and effective operation (e.g. Barrie and Paulson 1996, Clough and Sears 1994). However, project management texts do consider a whole project but in a systems engineering way which see people as a resource to be managed like an item of plant (e.g. Walker 1996, Moore and Hague 1999). In this way there appears to be a complete knowledge of the world available which only needs to be known in enough detail, and used correctly, to solve problems. Boyd and Wild (1993) refer to this as a “search for certainty” which causes problems for novices when they enter the real world “they try to use these techniques and experience failure as being due to their incomplete knowledge”.

The question that we are exploring is what really constitutes a professional practitioner. If we could answer this maybe we could teach more appropriately for practice and maybe also improve practice. Our approach has been to search for descriptions of this special knowledge and have focussed in on a study of implicit knowledge. This paper gives a brief outline of what implicit knowledge is and how it relates to practitioners. We discuss some of the methodological problems in investigating such knowledge because of its indeterminate and inexpressible nature. The paper reports on interviews with practitioners that sought to engage with such implicit knowledge particularly around working with others and working in teams. We

conclude that a much broader conception of practitioner knowledge is required which will change approaches to teaching and challenge current research into the improvement of practice.

A CONCEPT OF IMPLICIT KNOWLEDGE

Although no attention has been directed toward understanding the nature of knowledge in construction management, much has been written about general professional practice. The majority of studies make some differentiation in form of knowledge and in ways of exercising this knowledge. Indeed the ancient Greeks had four forms of knowledge: *episteme* (abstract generalization), *techne* (capability to accomplish a task), *phronesis* (practical and social wisdom) and *metis* (conjectural intelligence) (Baumard 1999). However such a breakdown referred to a different social and technological world than we have in the modern world. Most authors find two categories sufficient: explicit and implicit, although the terminology and the exact detail differ as shown in Table 1.

Table 1: Words used to refer to explicit and implicit knowledge

Explicit	Implicit
Objective	Tacit
Reified	Participative
Abstract	Intuitive
Codified	Indeterminate
Standardized	Judgement
Technical	Personal
Generalized	Contextual
Rational	Non-rational

Macdonald (1995) indicates that professional skills utilizes both abstract knowledge (Abbott 1988) and judgement (Larson 1977). However, it is the standardization of skills that has allowed the identity, hence definition, of a particular professional service. Most professions have a recognized base of complex, systematic, codified and generalized knowledge that they bring to bear on activities and which also form the basis of training. This is explicit knowledge. However, the exercise of judgement is not amenable to standardization or codification. This ‘indeterminacy’ (Jamous and Peloille 1977) is significant for all professions but a balance is struck between codified and indeterminate knowledge for the operation of both the task and professional project (Macdonald 1995).

This indeterminate or implicit knowledge is “the nature or essence” of something, which cannot or is not “revealed or expressed.” (Merriam-Webster Collegiate Dictionary). It is the knowledge that a practitioner knows but does not or cannot express. It is vague, not easily transmitted, and very difficult to teach. Some authors argue that it cannot be taught at all. Even a clear definition is difficult to find, although Polanyi, (1957), defines tacit through knowledge communicability “We know more than we can tell, and we know more than our behaviour consistently shows”. This is a very imprecise idea, and it is a much more difficult problem for educators than is explicit knowledge.

One key idea is that implicit knowledge is within the individual. It cannot be expressed, it can only be known to the person who holds it (Polanyi, 1957). Although Wenger (1998) and Baumard (1999) see a social dimension to knowledge, however, this is exhibited by an individual in relation to a community. In a similar way,

intuition allows us to integrate isolated bits of data and experiences into an integrated picture; thus, it is a holistic perception of reality that transcends rational ways of knowing (Khatri and Ng 2000). The process of intuition is very quick and almost automatic and so often can short-circuit step wise decision making, thus allowing an individual to know almost instantly what the best course of action is (Khatri and Ng 2000).

Implicit knowledge is not generalisable like abstract knowledge. It has value only in the particular context of practice, and consists not of knowledge that is theoretical, but rather is knowledge of “how to do things”, and “what is the right decision in this context”. (Horvath et.al. 1999). It is also knowledge which is suited to situations requiring decision making in uncertain contexts, where an immediate picture of the facts of the situation are not immediately apparent. By definition, professionals operate in a dynamic, human world, with all the difficulty that implies. The knowledge and skills they develop to cope with that world are not theoretical, they are real and concrete.

Implicit knowledge has a number of dangers (Wenger 1998). It can be a way of defining a group identity and then used simply to exclude others. Also, it may be the site of prejudice where socialized learning through group narratives pre-constructs approaches to other groups and configures an expectation of behaviour. Finally, as it is not explicit it is not reflected on and may not develop, thus, it may be unchallengeable and simply wrong.

METHODOLOGY OF INVESTIGATING IMPLICIT KNOWLEDGE

Even if we accept that implicit knowledge exists, researching non explicit and inexpressible knowledge is fraught with methodological problems. Since implicit knowledge is so vague and unclear, many authors have argued that we cannot know what specific implicit knowledge a professional possesses, and that we can only observe its effects by the behaviours that practitioners display as they practice (Argyris and Schon, 1974). Effective decisions and actions are in effect a definition of appropriate professional knowledge. As implicit knowledge cannot be stated, it is very difficult for an individual to even know that they possess such knowledge (Horvath, et.al. 1999). Indeed, Atkinson and Glaxton (2000) even suggest that there is merit in not knowing explicitly as they subtitle their book “On the value of not always knowing what one is doing”. When asked “what they do”, practitioners frequently respond that they do not know, “they just do it”. It appears to be something that a practitioner draws upon, but the source is not explicitly known. Also, the practitioner does not know how or where he acquired it, except “through experience”.

As it is not possible just to ask people to tell us what is not expressed then implicit knowledge needs to be investigated indirectly. Nonaka and Takeuchi (1995) have investigated how knowledge is transferred within organizations. Table 2 below helped us to understand the requirements for investigating tacit knowledge.

Table 2: Modes of Knowledge Conversion/Transference (Nonaka and Takeuchi (1995))

From\ To	Explicit	Tacit
Explicit	Combination	Internalization
Tacit	Articulation	Socialization

What we are seeking to do is to make the tacit explicit in some way. As Baumard (1999) eludes: one approach is to make tacit knowledge explicit by getting the interviewee to articulate what they do in particular circumstances and probing in detail complex actions. Another is for us to acquire the tacit knowledge through socialization and thence for us to articulate and so to make the tacit explicit. We believe that this can be done with in-depth interviews and by observation of practitioners.

The work reported here only deals with interviews at which we are socializing with the interviewee. We have then to infer the meaning of answers in terms of implicit knowledge. What we are engaging in, then, is knowledge elicitation (Sparrow 1998), which involves a deeper exploration of meaning: “discourse entails people putting their perceptions into sequences of words, and co-constructing the notion in the other person’s mind with that other person” (Sparrow 1998). This is not straightforward as during interview people actively reconstruct memory (Cortazzi 1993). In addition, the influence of the researcher needs to be acknowledged which Gummesson (1991) relates to the researcher's *pre-understanding*. He defines *pre-understanding* as peoples' knowledge, insights and experience before they engage with a research project. This allows an empathetic and rich understanding but also can release prejudices and preconceived explanations. The more consideration that is given to the input, i.e. *pre-understanding*, the greater the validity of the output, i.e. understanding.

Working with practitioners’ perception and interpreting from them means that we are adopting a naturalistic or phenomenological position (Easterby-Smith *et al.*, 1991). Our process is the generation of theories which forms different views of the same phenomena. Our world, then, is socially constructed and subjective, and value neutrality is unavailable. In this, we focus on meanings; trying to understand what is happening in a study of the totality of the conjoint situation which is in the interview as well as in their practice. Theories and concepts act as aids to the interrogation of stories and also the checking of their logical consistency so that an evaluation of the quality of evidence can be undertaken.

PRELIMINARY STUDY

The work here is a preliminary study of eight interviews with senior managers from the industry in the UK and USA. Five worked for contracting organizations and the others included an architectural manager, a quantity surveying manager and a procurement/legal consultant. These interviews were designed to look at their wider view of the world that they worked in. We see this wider view as the framework through which their implicit knowledge operates in particular circumstances. It is what causes individuals to see what they see, interpret it and devise a course of action. In particular we asked questions about relationships within the industry, how these related to forms of procurement and how they saw changes. We were also concerned to explore how they act in circumstances and how they believe they have learnt to do this.

What we have undertaken here is to search out quotes, which we believe relate to implicit knowledge. We have started this exercise around a notion of management and teams.

In response to a question on project management, a construction manager indicated:

The softer skills are probably [...] where the greatest wins are made. It's the interpersonal skills of the project manager[] being able to very quickly

*assess capabilities of personalities within this new group of people.
Working out [how] to actually get the very best out of all of them.*

What we believe we are having expressed is a particular skill, that the interviewee describes as interpersonal skills because that is what the management literature calls this. But this is an implicit skill because it involves quickly assessing people and then using this to design an approach to the project; this is not a rational analysis.

Another project manager gave an example of how he worked :

It's where the city's drainage engineers have produced one level of information, and our drainage engineers want another level of information, and they're both talking in a foreign language to me; because I don't understand the language that they're using to deal with their own profession. But I've got to bring them together, and somehow broker a peace, without actually knowing in great detail what it is they're arguing about.

In this more complex technical situation, he did not need to understand detail but have a holistic understanding of the informational as well as social requirements of a solution.

In a similar way when talking about a meeting another project manager stated:

[I] observe the people and see how they're interacting, watch the body language. [...] understanding the people you're dealing with, how to excite them, how to get the best out of them. When to spot when they're becoming frustrated and disenchanted, and really, it's the very best mix of all these ingredients for the project. Some people respond to gentle persuasion better than others who respond to sort of outright aggression.

Here the added element is judgement about the social environment and action needed. In this case we asked how did he acquire these skills.

I don't know that I have properly. I think it's what you learn [...], it's a set of skills that you acquire from the people around you. It certainly isn't something I've been taught. [...] I've had courses that look at psychology and look at body language, look at negotiation skills. I don't think they actually taught me anything. I think perhaps what they've actually done is honed skills. I think most of the skills are acquired through following people that you're working with.

This both indicates that such skills are not taught but most importantly that they are acquired from people through working with them. Indeed this can be regarded as the transfer of tacit knowledge through socialization. This was emphasized by another respondent:

A client I'm working with now is an absolute master at dealing with people in difficult political situations, and I actually spend more time sitting watching him now than I do thinking about the skills I've got [...] I'm constantly learning, as everybody is. But I think I'm actually learning something from him, I'm watching the way he operates, and some of it is spinning off.

Exploring where this knowledge is acquired one interviewee said

Nature or nurture [..]I think there has to be something in people's nature that allows the skills to be exaggerated and amplified. I've got a sort of charitable view of life which is that common sense probably was dished out in equal lumps to everybody, but rather it's just the way certain people choose to use it.

Whereas another revealed:

It was my father, actually, who was a structural engineer, taking me round as a young lad, round jobs and actually talking to people, I don't know, almost starting to see how people interacted, but without being part of the game. So the culture was already being formed, and then I was lucky enough to go into a working environment where the culture of the people immediately around me was to actually encourage this, and to allow you to observe without necessarily being threatened.

These quotes demonstrate that different practitioners understand their tacit worlds differently, i.e. their personalities affect their action.

We believe that in this preliminary analysis of our interview data, we can demonstrate the existence of implicit knowledge around the management of people. The language used (e.g. interpersonal skills) may appear to make explicit the use of this knowledge, however, we believe that these are merely labels. We do not believe that the interviewees know what they know nor how they use this knowledge. They struggle to find words to describe their actions and grasp conveniently at aspects but these fail to satisfy them as adequate descriptions of their practice.

CONSTITUTION OF PRACTITIONERS

Practice needs to be seen in a new way particularly not exclusively as the implementation of technical knowledge. Practitioners' work can be seen as an engagement with a complex, uncertain and conflicting world involving dimensions as shown in figure 1.

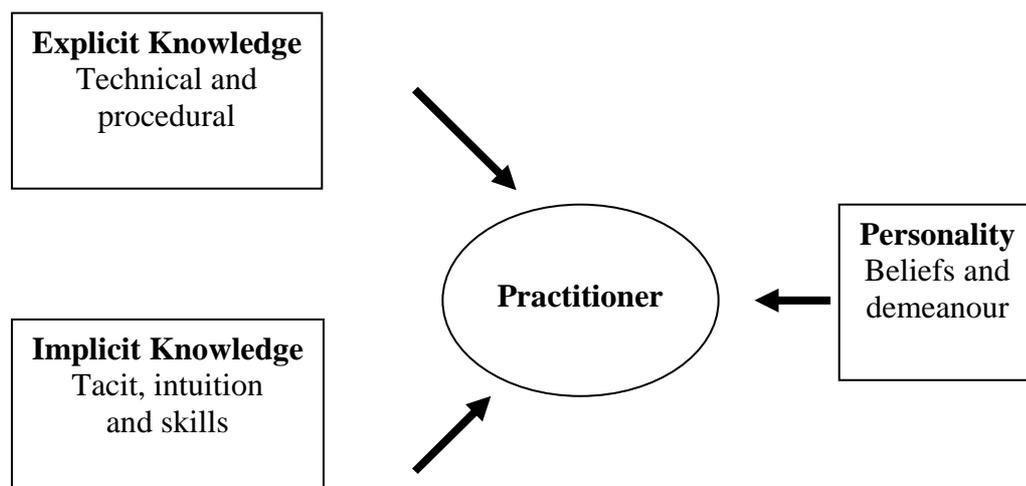


Figure 1: Constitution of a Practitioner

Practitioner knowledge is both rational i.e. that which can be made explicit, and non-rational that which is implicit and cannot be described in words. Action involves the

working with this knowledge both on the task and with people. Clearly the personality affects the knowledge and how it is used. Patel, *et al.* (1999) note that the key element of the expert's superior performance lies in the interconnectedness of his knowledge bases. No one characteristic alone is sufficient for superior performance. It is the total individual and his/her imbedded skills that make the difference.

Since implicit knowledge cannot be expressed, it cannot be communicated directly from a teacher to a student in say a lecture. It follows from this that if a practitioner is to acquire a body of implicit knowledge that he/she must acquire it through him or herself. As implicit knowledge is context specific, it is part and parcel of practice itself, not a product of formal education processes. Most adult learning takes place on the job in practice, and in the absence of actual practice, implicit knowledge is difficult to develop. (Horvath, *et al.* 1999). Of particular importance is the idea demonstrated from the interviews that they acquire implicit knowledge by observing other people. The idea of transfer of tacit knowledge through socializations involves being fully with someone and experiencing the whole situation and their model practitioners response to it. Such learning is acknowledged in Neuro Linguistic Programming (NLP) where individuals access the mental states of a model in order to learn (Knight 1995).

It is also true, though, that the acquisition of implicit knowledge does not occur automatically as a practitioner gains experience. Practice knowledge also requires a state of self awareness and a process of feedback in which the individual learns by reflection on his/her experience. In other words, tacit growth requires an opening of the mind to such developments. In these ways the personality of the learner is important in implicit knowledge, in comparison to explicit knowledge which is independent of the learner.

These ideas have implications for practitioner education. The individual must be in an appropriate context where he/she can make decisions, take action, make mistakes, then reflect on the results of their work, and learn accordingly. Simply adding tangentially teamwork to an academic curriculum does not acknowledge how implicit knowledge actually works. Getting students to articulate their tacit knowledge through reflection can help but it does require real experience. Simply placing undergraduates into teams and asking them to perform will not induce good implicit learning about teams. There are no individuals as models and socialization is not in a working context. Indeed the results of such an activity may be a mal-adapted implicit learning about teams which reinforces fears and prejudices. Practice requires the integration of explicit and implicit knowledge. Much of our current educational delivery and assessment is based on explicit knowledge; indeed excelling at explicit knowledge is rewarded in undergraduate courses. Individuals with polarized skills for learning explicit knowledge may find the learning and utilization of implicit knowledge difficult. Thus, it is possible that those that excel in education may not make good practitioners.

In a similar way to education, construction management research has not adequately acknowledged implicit knowledge. Social and human relations issues are separated from the totality of practice. Research has focussed exclusively on explicit issues particularly of a technical nature but even also of a social nature. As Baumard (1999) states "we all tolerate the same imprecision, we accept as a priori that the replication of the visible is a necessary and sufficient condition for the replication of the real". Understanding practice requires a different approach to study that acknowledges and

handles the implicit. Improving practice requires a full awareness of the operation and development of the implicit not just a logical connecting of idealized actions.

CONCLUSION

We believe that professional practice must be based on sound technical knowledge but that the concept of implicit or tacit knowledge needs to be integrated into descriptions of practice and into education. Implicit knowledge is beyond explicit professional knowledge and is part of a set of skills that is unique to the individual. However, neither explicit nor implicit knowledge is sufficient in itself, and one key to understanding professional performance is understanding the relationship between explicit and implicit knowledge. The development of professional knowledge is both personal and relative. A professional's individual knowledge is based in part on how they see a specific situation or process, and their insight will necessarily be different from that of other professionals. Their experiences will give them a different view of the professional world and this view will colour how they develop a picture of each situation and process. Implicit knowledge can only be learned not taught; therefore it is difficult to develop in undergraduate courses. These courses currently focus on explicit knowledge, thus, it may be that those that excel in examinations may not make excellent practitioners.

REFERENCES

- Abbott A (1988) *The System of Professions*, University of Chicago Press
- ACCE(1995) *Accreditation Standards for Construction Programs*, American Council for Construction Education.
- Anderson, J. (1992) *An Assessment of Education and Training Needs among Construction Personnel*, Construction Industry Institute, Texas
- Andrews J and Derbyshire A.(1993) *Crossing Boundaries*, London, Construction Industry Council, London
- Argyris, C. and D. A. Schön (1974). *Theory in practice : increasing professional effectiveness*. San Francisco, Jossey-Bass Publishers.
- Atkinson, T. and G. Claxton (2000). *The Intuitive Practitioner: on the value of not always knowing what one is doing*. Buckingham UK, The Open University Press.
- Barrie, D. and B. Paulson (1996) *Professional Construction Management*, McGraw-Hill.
- Baumard, P. (1999). *Tacit Knowledge in Organizations*. London, Sage Publications.
- Boyd and Wild (1993) Innovation and Learning in Construction Project Management, *Proceedings 9th Annual ARCOM Conference*, Oxford, September 1993, Ed., R Eastham and M Skitmore. ISBN 0951906070
- Business Round Table (1982) *Management Education and Academic Relations*, London
- Clough, R. H. and G. A. Sears (1994) *Construction Contracting*. New York, Wiley.
- Cortazzi M.(1993) *Narrative Analysis*, London, Farmer
- Easterby-Smith M. *et al.* (1991) *Management Research: an introduction*, London, Sage
- Franklin U. (1992) *The Real World of TECHNOLOGY*, Anansi, Ontario
- Gummesson E. (1991) *Qualitative Methods in Management Research*, London, sage
- Horvath, J. A., *et al.* (1999) Experience, Knowledge and Military Leadership. in *Tacit Knowledge in Professional Practice*. (Eds)R. J. Sternberg *et al.*, NJ, Erlbaum.

- Jamous H. and Peloille B.(1977) Changes in the French University Hospital System, in J.A. Jackson (Ed), *Professions and Professionalization*, Cambridge University Press
- Khatri K. and Ng H.A.(2000) The Role of Intuition in Strategic Decision Making, in *Human Relations* , 53(1), 57-86
- Knight S.(1995) *NLP at Work*, Nicholas Brealey Publications, London
- Larson M.S.(1997) *The Rise of Professionalism*, University of California Press
- Latham M (1994) *Constructing The Team*, London, HMSO
- Macdonald K. (1995) *The Sociology of the Professions*, Sage
- Moore D.R. and Haugh D.J. (1999) *Building Production Management Techniques*, Harlow, Pearson
- Nonaka I and Takeuchi (1995) *The Knowledge-Creating Company*, New York, Oxford University Press
- Patel, V.L.A (1999) Expertise and Tacit Knowledge in Medicine. In *Tacit Knowledge in Professional Practice*. (Eds)R. J. Sternberg *et al.*, NJ, Erlbaum
- Polanyi M. (1957) *The Tacit Dimension*, Wiley
- Simon H.(1969) *The Sciences of the Artificial*, Cambridge, MIT Press
- Sparrow J.(1998) *Knowledge in Organizations*, London, Sage
- Walker A.(1996) *Project Management in Construction*, 3rd Edition, BSP Prof
- Wenger E.(1998) *Communities of Practice*, New York, Cambridge University Press