

# **ETHNOGRAPHY IN THE CONSTRUCTION INDUSTRY: COMPETING BODIES OF KNOWLEDGE IN CIVIL ENGINEERING**

JOHN ROOKE and DAVID SEYMOUR

*School of Civil Engineering, University of Birmingham*

Published as: Rooke, J. & Seymour, D. (2002) 'Ethnography in the construction industry: Competing bodies of knowledge in civil engineering,' R. Fellows and D. Seymour (eds.) *Perspectives on Culture in Construction*, CIB, Rotterdam.

## ***THE ETHNOGRAPHIC APPROACH TO STUDYING CULTURE***

The ethnographic, or participant observation, approach to the study of culture originated in anthropology and has been a feature of anthropological and sociological research for over one hundred years. Possibly the earliest example of this approach is the work of Nikolai Miklouho-Maclay, who spent a decade from 1871 to 1882, studying the way of life of the people of the Madong district in New Guinea (Cheater 1989). Some important studies in anthropology and sociology have been Evans-Pritchard (1937), Whyte (1955), Wieder (1974) and Anderson, Hughes and Sharrock (1989). Some examples of the application of the approach in management studies have been Mintzberg (1973) and Kunda (1992). The essential feature of the participant observation approach is that the researcher gets to know a culture by living within it. This means that the researcher learns the culture in the same way that members of that culture learned it themselves: by talking to them; witnessing the way they live their lives; and taking part in their activities. There are a variety of ways in which such research can be pursued, depending on the time available to the researcher and the extent of the access to the research setting which s/he can negotiate. Much of the research is done through semi-structured interviews, or in-depth discussions with informants.

It is common for the researcher to have a principal informant, who will provide descriptions, as well as act as a guide to the setting. Where direct observation is possible, this is always preferable and if audio recordings can be made, these prove extremely useful. The utility of video recordings is more controversial, since these are considered intrusive. Participating in the activities which are being researched enables researchers to test their impressions and reasoning about the setting, in a way that is unavailable in any other research approach. Participation also makes the researcher's presence in the setting less intrusive, reducing its impact on the natural order of interaction taking place there. Ethnographic studies can be conducted from a number of perspectives. Mintzberg, for instance, used a grounded theory approach, while Kunda works from a critical perspective. Our own approach is ethnomethodological. This means that our focus is on analysing the ways in which people perform their mundane activities in a visibly orderly manner. The analysis stands as an account of the ways people make sense of (or order) the world and communicate that understanding in the course of their activities. Thus, the analysis is intended as a report of the analysis that takes place in the setting under study. Every effort is made to resist importing into the analysis of a situation any analytic device which is not already in use in that situation.

The findings reported here have originated from a number of sources over a period of many years. The three incidents which form the core of the study were observed in the course of field research. However, an important feature of this report, is that it draws on the authors' experience of teaching post-graduate students with previous experience in the industry. The teaching of experienced practitioners allows the researcher/teacher to conduct participant observation as s/he facilitates classroom

discussions which, as will be shown below, replicate the culture of the industry in the classroom.

## **TWO BODIES OF KNOWLEDGE**

Several years of ethnographic research at the University of Birmingham have enabled us to characterise several important features of the construction industry in the UK. One of these is the existence of two distinct approaches to knowledge about the physical possibilities and constraints of construction. Each of these approaches consists of a different set of practices for the acquisition, constitution, evaluation and application of knowledge. Each leads to the constitution of a body of knowledge which, while often complementing the other, can sometimes come into contradiction with it. The difference between them loosely parallels the distinction which Ryle (1963) draws between 'knowing how' and 'knowing that'. The first of these is practical, implying the skill, or ability, to perform some task, or activity (*knowing how* to erect a falsework system, for instance). The second is an objectified form of knowledge, such as that possessed by academics and professionals, it is knowledge about something (for example, *knowing that* the square on the hypotenuse is equal to the square on the other two sides of a right angled triangle). Of course, all human beings possess both kinds of knowledge, but their knowledge of a particular domain of interest may be biased towards one kind, or the other. We have found this to be the case in construction.

On the one hand there is an objective body of knowledge which is shared by members of the engineering profession. We shall refer to this as 'engineering knowledge'. On the other, there is a body of practical knowledge that is possessed by experienced site personnel. We shall refer to this as 'site knowledge'. We will distinguish between these bodies of knowledge in three ways: its mode of acquisition; its mode of validation; and its domain of application. Engineering knowledge is acquired in colleges, mainly from books and lectures; it is heavily biased towards knowing-that, though some effort is made to provide laboratory and field experience. Site knowledge is acquired on site, in the normal course of the day's work, by observing more experienced people and by attempting to perform new tasks. Consequently, engineering knowledge is validated by the possession of academic and professional qualifications which stand as a guarantee that their possessor will perform in a competent manner, while site knowledge is validated only by the demonstrated ability to perform tasks successfully. Finally, engineering knowledge is concerned primarily with the theoretic viability of constructions. Site knowledge, on the other hand, is concerned primarily with the processes by which those constructions are physically realised. Of course, these two domains cannot be separated, they interpenetrate and it is this that leads to competing claims to truth.

The competing claims to truth which arise out of these contradictions can often underpin disputes which might appear, on the surface at least, to be entirely about conflicts of economic interest. We offer three examples.

One occasion concerns the judgement of a contractor, that the reinforcement in a concrete slab was over-designed. The contractor was facing a loss on the job and looking for ways to save money. Thus, the decision was made to reduce the amount of reinforcement in the slab. This was done without seeking the approval of the RE. The rebar was removed from site and the concrete poured in the RE's absence.

A second occasion concerns the finding, by a contractor on site, that a section of reinforcement could not be fitted into place. The contractor made representations to the consultant that the placing of the reinforcement was physically impossible. The consultant replied that the contractor had been warned that placing the steel would be difficult and they had contracted to do it. The contractor responded that they had not had reinforcement drawings at the time; and that anyway, "impossible is impossible". A member of the contractor organization accounted for the dispute in the following

manner:

“I think it's because blokes have never actually fitted a bit of shutter and tried to fit it and get the tolerances and get it poured within the time. Because if the steel's wrong, it doesn't fit. An if it's only an inch out it just doesn't bloody work.”

The final occasion concerns the construction of a loading gantry by site operatives. This was found by the Resident Engineer to be unsafe and was referred to the contractor's engineers for redesign. A somewhat smaller gantry, with the same basic design features, was designed and built. The designer of the original gantry, a formwork carpenter, continued to maintain that the redesign was unnecessary and that his own design had been proved adequate by use on previous occasions.

It is not our intention to pass judgement on any of these cases (and certainly not to endorse the action of the contractor in the first example, which, whatever the technical correctness of his judgement, was clearly illegal!). On the contrary, it is our contention that, in the absence of further information, any of the positions described might be correct. Our intention is to show that these positions, while they derive in part from economic motives, are also based on judgements stemming from the two bodies of knowledge.

It is certainly the case that one thing these three incidents have in common is that, to varying degrees, they reflect a conflict of commercial interest. This is perhaps clearest in the first example, where the contractor made a direct saving by reducing the quantity of reinforcement in the slab. In the second example, depending on whose version we believe, the contractor was trying to avoid a particularly difficult task, or the consultant was trying to avoid the cost and embarrassment of redesign and to save his client from having to pay for delays which the consultant had himself caused. In the last, the operatives wished to avoid having to dismantle and rebuild the gantry.

However, running through the three examples (and many others) is another common thread, concerning the ways in which the opposing sides in the conflict assess and validate the truth of a proposition. Thus, in all three cases, the contractors were arguing from a basis of knowledge gained from experience, while the engineers were arguing from engineering principles which form part of a professional and scientific body of knowledge. This can be most clearly seen in the last example, where the carpenter specifically referred to his past experience to validate his claim to knowledge. In the second, although the contractors defended their position by claiming an absence of drawings prior to contract, it was their immediate experience of attempting to place the reinforcement on site, which led them to claim that the task was impossible. In the first example, the arguments are not explicit, since the action of the contractor was covert. However, in justifying his actions to the researcher, he referred to previous, similar jobs in which he had 'used a lot less rebar'. The resulting structure, he claimed, was 'perfectly sound'.

Sharrock (1974) highlights the importance of 'ownership' of knowledge. He notes that the relationship between particular bodies of knowledge and collectivities is such that collectivities can be said to have ownership rights over bodies of knowledge. These ownership rights are jealously defended. Thus, in a real sense, engineering knowledge belongs to engineers; only engineers are properly qualified to make engineering decisions. Even if a non-engineer makes a correct engineering decision, this decision cannot be known to be correct until it has been validated by a properly qualified engineer. In contrast, site knowledge belongs to anyone who has site experience, whether engineer or not. Those who possess it are capable of making sound decisions about the construction process which are unavailable to those without such experience. Thus, they too are arbiters of truth in a particular domain.

The divide which exists between the respective holders of these two bodies of knowledge can be profound. As Willis (1977) observes, the preference for experiential

over book knowledge can be extremely strong among manual workers:

“The shopfloor abounds with apocryphal stories about the idiocy of purely theoretical knowledge. Practical ability always comes first and is a *condition* of other kinds of knowledge.” (p56)

However, even among engineers, their site experience is highly valued. They can often be patronising or contemptuous towards the ‘curly d’s’, as purely theoretical engineers are sometimes known. One experienced site engineer observed of his colleagues in the design office, “the only thing they’ve ever built was a garden shed; and that fell down”. Similarly, engineers’ confidence in their professional and scientifically based knowledge can lead to distrust and contempt for extemporised solutions emanating from unqualified site personnel. Furthermore, their distrust is exacerbated by the, often justified, suspicion that the contractor is attempting to trick them.

## **THE DISTRIBUTION OF KNOWLEDGE**

It is clear that in determining who has access to, or properly owns, these bodies of knowledge, it is not sufficient to draw a distinction between engineers on the one hand and unqualified site personnel on the other. Indeed, to capture even an approximate picture, it is necessary to make a whole series of distinctions: between designers and site personnel; between engineers and non-engineers; between contractors and clients’ representatives; and finally, between accommodating and non-accommodating Resident Engineers (REs). These paired categorisations work in a similar fashion to Russian dolls, one part of each pair containing the pair which follows it. The relationships between them all can be represented diagrammatically (fig 1).

Thus, for our purposes here, civil engineering personnel are divided into designers and site personnel. This categorisation by no means covers all individuals involved in civil engineering, but is sufficient for our purpose. Designers typically have no, or very little, site experience. Crucially, they will often undervalue such experience. They know, of course, that operatives have specialist skills and experience which enable them to achieve the physical realisation of the design, but this knowledge (a) does not merit the status of professional knowledge and (b) does not qualify those who possess it to alter, or question the design. They will see any deviation from their design specifications as an attempt by the contractor to ‘cut corners’, in order to increase their profits. It is regarded as a universal (and, indeed, almost acceptable) motivation among contractors, to try to ‘get one over on the client’. Site personnel may be divided between engineers and non-engineers. We will not attempt to specify the many kinds of non-engineer on site; most important for our purposes are skilled operatives and first line managers (foremen). It is these individuals who are the primary owners of site knowledge. They often feel that engineers are over-cautious in their estimates of the viability of structures. Site engineers, of course, have access to and own both kinds of knowledge. However, they are without primacy in either. Thus, on the one hand, a wise site agent (these days more likely to be known as a project manager) will defer to his foreman. On the other, he will recognise that he has far less professional status than a top consultant. This does not mean that site engineers will not look down on designers for their lack of practical experience, as is illustrated by the remark about the garden shed above.

Contractors’ site engineers often display some bitterness towards those on the client’s team. They are aware that the site knowledge which is their speciality is not highly valued in the profession. Several have complained to us that they are often regarded as nothing more than “hairy-arsed builders”. Client’s representatives display less rancour, though it is important to distinguish between the ‘reasonable’ REs and the ‘spec-wavers’. This last pair of categories is less objective than the others, in that it contains a contractor’s value judgement. As the arbiter of the adequacy of any piece

of work, the RE's attitude is of vital concern to the contractor; it can determine both the working atmosphere on site and the ultimate profitability of the job. Here again, then, commercial concerns must intrude upon the contractor's judgement as to the reasonableness of the RE. However, the accusation made against the 'spec-wavers' is that they pay too much attention to the theoretically derived engineering specifications and insufficient to the imperfect realities of site work. Thus, in the contractor's view, reasonable flaws and tolerances are ruled unacceptable, measured against the unrealistic standards of those who spend the bulk of their working days in warm offices. The RE, therefore, can be seen to be pivotally balanced between the two forms of knowledge, crucially engaged in formulating decisions which should be correct according to both.

## ***PROBLEMS AND SOLUTIONS***

We draw three conclusions about consequences for better management in the industry, in particular, for developing new ways of avoiding and settling disputes. These conclusions are primarily directed towards the UK industry, though they may be more generally applicable.

First, the adversarial nature of the UK construction industry has long been a source of regretful comment. By describing this and other features of industry culture, it is intended to promote greater understanding between different perspectives within the industry. If differences which are regarded as purely matters of commercial interest, can be seen as stemming from genuine and principled differences in ways of looking at things, it may be possible to develop more constructive solutions to them.

Secondly, as a step towards this and towards the narrowing of differences in the first place, the following directions for the improvement of training and professional development are suggested:

- Steps could be taken to ensure that design engineers have greater experience of work on site, as part of their professional development;
- An extension of what is generally regarded as an adequate education for civil engineers could include a greater focus on the construction process;
- Courses in engineering could be made available to the more intelligent and capable site operatives, as part of a systematic approach to developing a skilled workforce.

Finally, and more generally, there is a clear implication, in order to engage an important section of the industry, innovation should be presented in a practical, rather than a theoretical manner.

## ***CULTURE IN THE CLASSROOM***

We have used illustrative examples like those given above for teaching purposes with mature students from a variety of national backgrounds. These have been professional engineers with experience of construction, usually in client, but sometimes in contracting organizations. Our aim has been twofold, to bring to their attention what we take to be an important feature of industry culture, but also to encourage them to think more generally about the way taken for granted assumptions can act as obstacles to effective management. They have been asked to give their own interpretations of the three examples.

Almost universally, they see the differences of opinion outlined in the examples above, purely as expressions of commercial interest. We prompt them with the idea that other interpretations are possible and encourage them to consider what role culture might

be playing. In particular, we attempt to highlight the fact that an important distinguishing feature of any culture is the way it conceives of and validates different kinds of knowledge and that in the examples we see cultural differences being played out. We have difficulty in getting to them to accept this alternative interpretation. Students would rather continue to insist on the commercial nature of the dispute (which, of course, we do not deny) and to raise technical arguments to show that the site solution was wrong. For example, a response to the removal of the reinforcement from the foundation slab was: "How did they know that there weren't plans to add another six stories at a later date?" Even when contractor's engineers are present, the tendency is to continue in the same mode. Although they will be naturally more sympathetic to the contractor's point of view they will tend to couch their defence of this position in economic and technical terms also. Thus, they will argue that designers are insensitive to the economic realities of construction, or the physical constraints of site work.

Thus, the students merely continue the arguments illustrated in the examples, while we attempt to persuade them to accept a third point of view, that both sides of the argument are valid in their own terms. There is no way, we maintain, of deciding the correctness of the judgements made by either side of the argument in any of the examples given. Nor are these judgements merely commercially biased interpretations of the same technical knowledge. They are based, as we have argued above, upon different ways of learning and of validating one's knowledge; and on a difference in focus between design and construction processes. Given the nature of the phenomenon we are describing, it is not surprising, that engineers find it difficult to see. As noted above, an important aspect of that phenomenon is the mutual lack of respect which exists between the holders of the respective bodies of knowledge. What we observe in the classroom is a reproduction of the very culture about which we are attempting to teach our students. We find ourselves struggling against the very barriers to communication which we are attempting to describe. If, in the course of their daily work on construction projects, engineers do not respect the experience of site personnel, there is no reason why they should suddenly begin to do so merely because they are now at the University. Furthermore, the evidence from the reaction of the students is that the phenomenon is not restricted to the UK. If anything, engineers from Africa and Latin America, for example, have even greater difficulties in accepting our arguments.

## **GETTING KNOWLEDGE ACCEPTED**

What can be done to induce recognition in our students that we are talking about cultural differences and the way they impede mutual understanding? In particular, how do we get them to accept that their conception of knowledge is the product of a distinct cultural formation and that others, with whom they work, will have acquired a different one? Clearly, all members of the industry can and will learn by experience. To return to our three examples, it is reasonable to expect that these incidents will affect those involved to the extent that they will produce better re-enforcement designs, or build smaller gantries in the future. However, our aim should be to circumvent such occurrences as much as possible, to design them out of the construction process.

The suggestions for improvement made above (more site experience for student engineers, more engineering training for skilled operatives and first line managers) would, we believe, go a long way towards achieving that aim. The question is, how do we achieve such training initiatives within the existing culture? Here is the rub. The changes we are proposing are a direct challenge to that culture. However, they must be introduced within it. If they are to flourish, they must find support within the culture.

How is that to be achieved? With regard to students, one solution might be to try to

get them out on site early, before they have a professional status to protect. However, this comes up against the same problem. Those who control the courses are themselves professional engineers, usually with little or no site experience. Indeed, as academics, they are probably more heavily committed than most to the primacy of engineering knowledge. How can such people be convinced of our argument?

Our suggestion is that the first step towards the changes we are proposing should be made within the conventional boundaries of formal education.

If engineers were taught to think more in terms of construction process: including the human (and thus, inevitably cultural) processes which any work activity must involve, they would begin to appreciate some of the problems involved. Such is the emphasis, for example, of Lean Construction which, following the precepts developed in manufacturing, insists on the integrity of designing product *and* process. Again, this needs to be done early, as part of first degrees. Civil Engineering degrees have become more management oriented in recent years, in recognition of the fact that the management of construction projects is as much an engineer's responsibility as the design of structures. However, the emphasis has been particularly on such areas as contract, law and economics. Such human relations input as there has been has tended to be of a generic nature, borrowed from main stream management studies. The construction process has been virtually ignored. There has been little attempt to specify the realities of site work.

Thus, part of the solution, we believe, is more and better ethnographies. We know of only two full length studies in the field of construction management: Clegg (1975); and Bresnen (1990). Even these two, while they contain some useful ethnographic detail, are heavily biased towards theoretical discussion. Consequently, the main features of industry culture remain undescribed.

There is, indeed, some resistance to ethnographic studies among the construction management community and there has been something of a struggle to gain acceptance of them. Part of the problem is that they just don't look to engineers like research reports. They do not commence with set objectives, or present sets of numerical results. Much of the information supplied in the ethnography is often superfluous to the central argument. (There is not space here to discuss the very good reasons for this.)

Nevertheless, they are recognisably products of academic activity and thus more acceptable in the context of education and professional training than, say, a day spent on a building site. It is relatively easy to introduce them into management courses as set readings and bases for group discussions, simulations, or essays. As such, they constitute a practical first step in the long journey to bridge the gap between engineering theory and construction practice.

## **REFERENCES**

- ANDERSON, R. J., HUGHES, J. A. & SHARROCK, W. W. 1989 *Working for profit: the social organisation of calculation in an entrepreneurial firm*, Avebury, Aldershot.
- BRESNEN, M. 1990 *Organising Construction: project organisation and matrix management*, Routledge, London.
- CHEATER, A. 1989 *Social Anthropology*, second edition, Unwin Hyman, London.
- CLEGG, S. 1975 *Power, Rule and Domination: a critical and empirical understanding of power in sociological theory and organizational life*, Routledge & Kegan Paul, London.
- EVANS-PRITCHARD, E. E. 1937 *Witchcraft, Oracles and Magic Among the Azande*, Oxford University Press.

- KUNDA, G. 1992 *Engineering Culture: control and commitment in a high tech corporation*, Temple University Press, Philadelphia.
- MINTZBERG, H. 1973 *The Nature of Managerial Work*, Harper & Row, New York.
- RYLE, G. 1963 *The Concept of Mind*, Penguin, Harmondsworth.
- SHARROCK, W. W. 1974 'On Owning Knowledge' in R. Turner (ed.) *Ethnomethodology*, Penguin, Harmondsworth.
- WHYTE, W. F. 1955 *Street Corner Society*, The University of Chicago Press.
- WIEDER, D. L. 1974 *Language and Social Reality*, Mouton, The Hague.
- WILLIS, P. 1977 *Learning to Labour*, Gower, Aldershot.



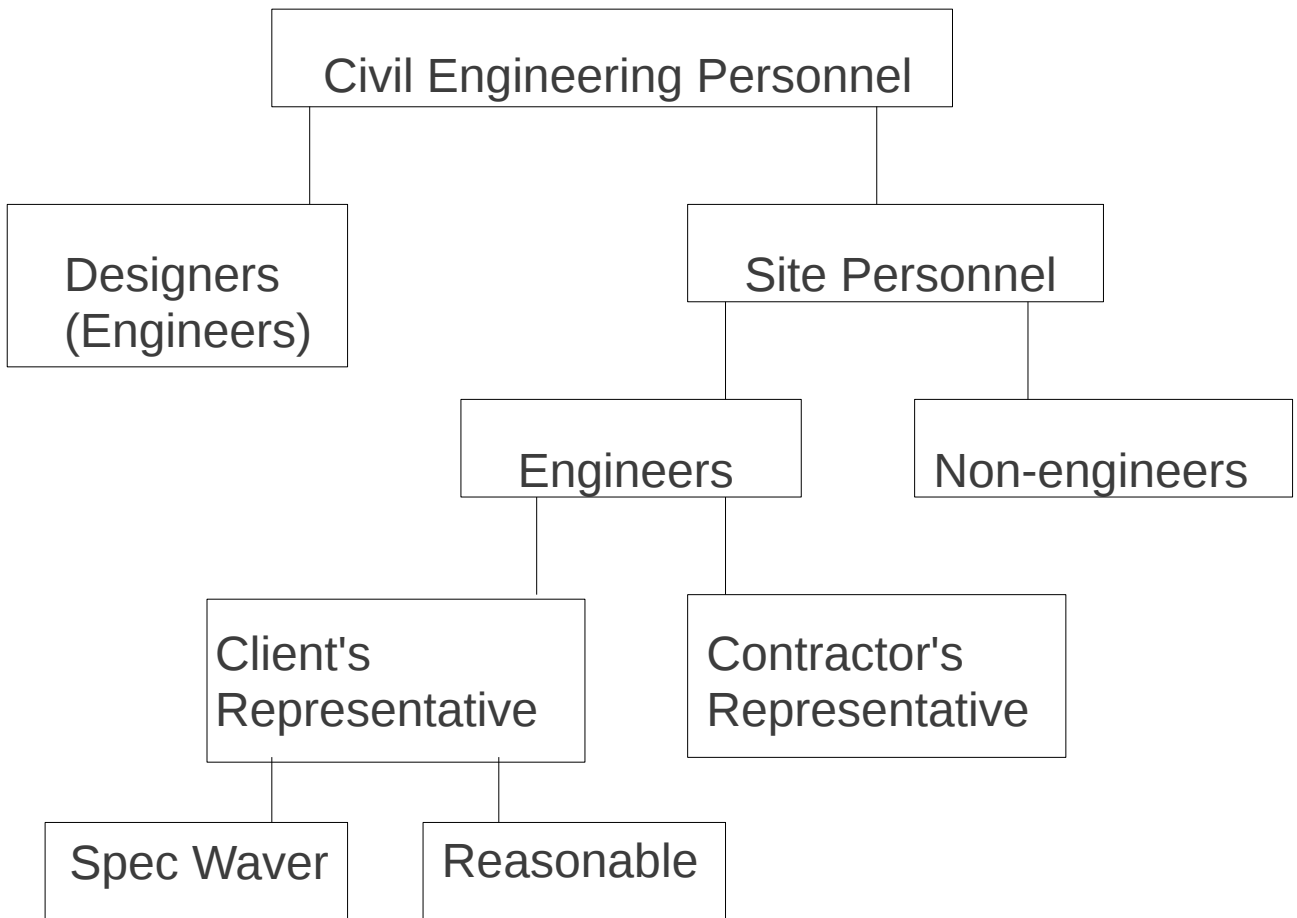


Figure 1.