COGNITIVE AND PRACTICE-BASED THEORIES OF ORGANISATIONAL KNOWING AND LEARNING: INCOMPATIBLE OR COMPLEMENTARY?

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ABSTRACT

Cognitive and practice-based approaches to organisational knowledge and learning are typically portrayed as incommensurable, with the result that there has been little positive dialogue between the two traditions. This paper argues that the incompatibility of the two sets of approaches has been overstated and that there is actually much that each can learn from the other. Cognitive approaches, which have often been accused of offering an effectively individualised, static, and representationalist understanding of organisational knowledge, can benefit from taking on board the practice-based view of knowledge as historically, culturally, and socially situated. However, the paper also suggests that practice-based theories would do well to draw insights from cognitive approaches, particularly regarding the role of cognitive frameworks or schemata in guiding knowledge processes. Without this, practice-based theories struggle to offer a fully developed account of how practices are constituted, reproduced, and potentially transformed through the interplay between routine and reflective action. To provide an example of how cognitive and practice-based approaches can be integrated, the latter part of the paper offers an empirical illustration of how a team of consulting engineers represent and perform alternative schemas of project work through their day-to-day practices. This provides the opportunity to reflect on both the theoretical and methodological challenges of pursuing a rapprochement between practice-based theory and cognitive approaches to organisational knowledge and learning.

1 INTRODUCTION

Cognitive and practice-based theories have informed two influential strands of the literature on organisational knowledge and learning. There has generally not been a great deal of exchange between these two traditions, unless it is to be critical of the other. Practice-based approaches have been especially dismissive of cognitive approaches (e.g. Cook and Yanow, 1993; Gherardi, 1999, 2000, 2001, 2006; Gherardi and Nicolini, 2002; Lave and Wenger, 1991; Nicolini *et al.,* 2003; Orlikowski, 2000, 2002; Suchman, 1988). However, in this paper it is argued that there is actually much to be gained from establishing a more productive dialogue between the two perspectives. As with many attempts at fusing insights from multiple theoretical positions, there are potential dangers that need to be taken into account. This is particularly the case where the perspectives in question are derived from quite distinct ontological and epistemological positions and grounded in radically

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different sets of guiding assumptions. Bearing these obstacles in mind, my argument in this paper is two fold.

The first part of the argument is to suggest that practice-based theories have been, at least partly, justifiable in their criticisms of conventional cognitive approaches, but that this in itself is not a reason to dismiss any cognitive accounts of organisational knowledge and learning. Gherardi (2006, p. xv) has argued that cognitive approaches suggest "that knowledge resides in the heads of persons, and that it is appropriated, transmitted and stored by means of mentalistic processes. This figure works through the dichotomies of mind/body, thought/action, individual/organization. Its watchword is 'organizational learning', and also 'cognitive framework' or 'traditional cognitive learning theory'". To a large degree this argument is quite valid. To the extent that cognitive approaches have drawn on models of information processing, it is true that they tend towards a rather static, functionalist, and ultimately individualistic portrayal of learning as the passive acquisition of knowledge. Practice-based theories, by contrast, emphasise the dynamic, processual, and inescapably social and material character of knowing. Cognition is not something that primarily takes place 'in the head' through the cold and dispassionate mental operations of individual cognitive agents that are somehow detached from the world of activity in which they much necessarily be embedded (Lave, 1988). The information processing tradition underlying cognitive approaches also tends towards portraying knowledge in rationalistic (albeit boundedly rational) and representational terms (c.f. Rorty, 1979; Wingrad and Flores, 1986). In opposition to this, practice-based theories adopt a more holistic, constructionist position in which the various element of thinking, doing, and being, and the social, cultural, historical, and material settings within which they take place are conceived in relationships of co-constitution.

From the above characterisation of cognitive approaches it would seem that they have little in common with practice-based theories and that a rapprochement between the two would be surprising, if not downright ill-advised. However, there are times when the portrayal of the former by the latter often verges on caricature, not really acknowledging the changes that have been happening within the cognitive literature that addresses some of the criticisms raised (see Schwartz, 1998, for an overview). Consequently, the second element of my argument is to suggest that by being excessively wary of invoking any cognitive explanations, practice-based approaches are actually placing an unnecessary limitation on themselves. The main point is that acknowledging a cognitive dimension to knowing does not have to be incompatible with a socially situated, constructionist, and processual view. Practice-based approaches make frequent mention of the enduring and patterned character of social action, often drawing on insights from sociological accounts of practice (e.g. Bourdieu, 1977, 1992; Giddens, 1979, 1984). A key issue here is not only about how practices are reproduced over time, but also how they are modified and transformed as they are enacted or 'instantiated'. Informed by work on cognitive sociology, I argue that individual and collective cognitive frameworks or schemata play a central and dynamic role here (Cicourel, 1973, 1981; Zerubavel, 1999). It is not necessary to see schemata in purely computational terms as providing the algorithms and transformation rules that mediate between the input and output elements of information processes. They can be conceptualised in much broader and less mechanistic terms as providing the, often implicit, unarticulated, and shifting background upon which knowledge and action are grounded. The emphasis here shifts from the rule-based processing of information as representations of reality, to the role of interpretative schemas in guiding how unfolding social realities are

constituted through processes of enactive sensemaking (Weick, 1979, 1995). Schemata provide the crucial link between past, present, and future that permit both the reproducibility and transformational capacity of practices, allowing genuine agency without voluntarism and regularities of action without determinism.

As well as the conceptual challenges of merging insights from two hitherto quite separate, and one might even say antagonistic fields, there are also important methodological issues. Here as well there are important different between the two traditions which, again, have tended, prematurely I would suggest, as irreconcilable. Influenced by approaches such as ethnomethodology, practice-based theories tend to assume that the situated intelligibility of practices can mainly be grasped through observation. This is because, as Gherardi (2006, p. 30) has argued, "actions speak for themselves" since they "'reflexively' display their nature as meaningful to social actors" and so permit the reconstruction of their meaning by external observers. Cognitive approaches, by contrast, have tended to depend more on eliciting the structure, content, and processes of cognition through techniques requiring participants to provide a more or less direct account of their perspectives and actions, as well as a heavy reliance on experimental and simulation studies. Certainly many of these techniques have been applied in a positivistic fashion that tends to reinforce the problems of static, individualistic, and reductionist arguments for which cognitive approaches have been rightly criticised (Greeno, 1998). However, it is by no means inevitable that one has to subscribe to a positivist programme in seeking to elicit the nature of individual and collective cognition, just as one does not necessarily have to rely wholly on attempting to infer the meaning of practices from observation.

To illustrate how the conceptual and methodological task of combining practice-based and cognitive approaches might be achieved, the second half of the paper offers an example drawn from research currently being conducted by the author into knowledge, learning, and communication in multi-functional engineering teams. This study is pursuing a multi-method approach that involves not only observing teams in action through ethnographic research, but also using other techniques drawn from studies of cognition for mapping individual and shared schemas, which have been applied particularly in the areas of organisational strategy and team dynamics (e.g. Cooke *et al.,* 2000; Hodgkinson, 2005; Huff, 1990; Langan-Fox *et al.,* 2000; Porac and Thomas, 1990). One aim is to explore the possibilities and limitations of using techniques from cognitive approaches in a more action-orientated and socially situated manner than has often been the case previously. The focus is on considering the intricate interplay between individual and group schemata as dynamic, context-dependent, and embodied representations that are variably constructed, drawn upon, and revised in the course of the day-to-day communicative and other practices of teams of consulting engineers.

2 COGNITIVE APPROACHES TO ORGANISATIONAL KNOWLEDGE AND LEARNING

As several authors have observed, cognitive approaches form one of the most influential strands of the literature on organisational knowledge and learning. Swan *et al.* (1999), for example, distinguish between cognitive and community models of organisational knowledge. The former, as Sørensen and Lundh-Snis (2001, p. 85) explain, "denotes a perspective where valuable knowledge is conceived as being captured and codified from

individuals, packaged, transmitted and processed through the use of ICT, and hence disseminated and used by other individuals in new contexts. In this perspective, knowledge can also be exploited through the recycling of existing knowledge 'owned' and 'experienced' by individuals in cognitive networks". The community model, which holds much in common with practice-based theories, by contrast "portrays the management of knowledge as socially constructed through interaction within communities of practice … Knowledge creation and learning are processes of making sense of knowledge in social activities deeply rooted in daily work practice" (*ibid.*, p. 85). Other similar characterisations of the organisational knowledge literature include the distinction drawn by Cook and Brown (1999) between epistemologies of possession and practice, and that by Gherardi (2000) between mentalist or functionalist perspectives and practice-based theorising. Despite differences in terminology, these characterisations all refer to one set of approaches to organisational knowledge and learning that are strongly informed by ideas drawn from conventional cognitive psychology, itself dominantly based on an information processing view of cognition (e.g. Anderson, 1983, Broadbent, 1958, Bruner *et al.,* 1956, Fiske and Taylor, 1984, McClelland *et al.,* 1987, Miller, 1956, Neisser, 1967, Newell & Simon, 1972). While information processing has proven to be a useful metaphor for processes of organisational knowledge and learning, contributing numerous valuable insights, it also brings with it some theoretical baggage that ultimately limits its usefulness.

There are three key limitations of orthodox views of cognition that impact upon cognitive approaches to organisational knowledge. These are, firstly, the representationalist tendencies of the information processing perspective; secondly, an individualistic and mentalist emphasis that limits attempts to arrive at a genuinely social understanding of organisational knowledge; and thirdly, at least in some segments of the literature, a focus on simulated or experimental settings in seeking empirical support, rather than investigating what have been called 'intact activity systems' (Greeno, 1998).

2.1 Information Processing and Representationalism

One of the key elements of the information processing perspective is the positing of pre-existing cognitive structures that guide perception and provide an important heuristic function in people's information processing strategies. Such structures have been variously referred to as frames (Minsky, 1975; Mitchell, 1986), scripts (Abelson, 1981; Schank and Abelson, 1977), schemata (Moussavi and Evans, 1993; Rummelhart, 1984), categories (Rosch, 1978), personal constructs (Kelly, 1955), cognitive maps (Tolman, 1948), and mental models (Gentner and Stevens, 1983; Johnson-Laird, 1983). Taking the form of simplified "internal working models of the world" (Badke-Schaub *et al.,* 2007, p. 7), these cognitive frameworks are seen as economising devices allowing predictions to be made about likely future states of affairs and channelling the assimilation of new information without undue cognitive effort (Craik, 1943; Johnson-Laird, 1983). In this sense, people are depicted as 'cognitive misers', relying on established frameworks, models, or schemata to economise on the use of limited cognitive and attentional resources (Fiske and Taylor, 1984). This in itself is not problematic as a considerable volume of research has supported the existence of heuristics of various forms (e.g. Gilovich *et al.,* 2002; Kahneman *et al.,* 1982). However, difficulties arise when, as in the cognitive literature on organisational knowledge and learning, heuristics are conceived primarily as having a representational role, intended to mirror more or less faithfully, albeit in synoptic form, various phenomena

'out there' in the world (c.f. Rorty, 1979). Winograd and Flores (1986, p. 73) have summarised the key features of information processing approaches in the following terms:

> At its simplest, the rationalistic view accepts the existence of an objective reality, made up of things bearing properties and entering into relations. A cognitive being 'gathers information' about those things and builds up a 'mental model' which will be in some respects correct (a faithful representation of reality) and in other respects incorrect. Knowledge is a storehouse of representations, which will be called upon for use in reasoning and which can be translated into language. Thinking is a process of manipulating representations.

The problem with representationalism is that it relies on a series of excessively strict dualisms between mind and body, thought and reality, individual and environment. As Descombe (2001) has argued, the understanding of mental acts needs to be broadened out to embrace not only the states of mind of individual brains that appear as somehow detached from the world, and instead to emphasise the actively engaged, embodied, collective, culturally- and historically specific character of knowing. It is arguably also the case that a representationalist view tends to prioritise structure over process and statics over dynamics. As a consequence there has been less attention paid to how individual or organisational schemata are formed, reproduced, modified, or overturned over time, or how malleable they are depending on the alternative contexts and social settings within which they are drawn upon and performed (c.f. Goffman, 1959).

2.2 Cognitivism and the Social Character of Knowing

The second limitation of the cognitive tradition concerns the individualistic and mentalistic way in which knowing and acting are depicted (Norman, 1993; Schwartz, 1998). It may seem counter-intuitive that a body of work purporting to deal with the thoroughly social phenomena of organisational knowledge and learning could exhibit an individualistic bias, but this is evident in one of two tendencies in the literature. The first, which sidesteps the issue of how social coordination is actually accomplished, simply treats organisations as if they are individual actors and draws analogies between individual and organisational cognition. This style of argument can regularly be found in much of the writing on the economics of organisational knowledge and capabilities (e.g. Grant, 1996; Nelson and Winter, 1982; Teece *et al.,* 1997; Winter, 1987). Here the organisation is often reified as a unitary actor, based on the problematic assumption of an equivalence between individual and organisational cognition. The second, which is equally flawed, treats organisational cognition as a straightforward aggregate of the individual cognitions of its members. This approach can be found in the earlier IT focused writing on knowledge management that portrayed organisations as a collection of atomised individuals possessing different types of knowledge (e.g. Croy *et al.,* 1997; Gore and Gore, 1999; Sher and Lee, 2004). The challenge, which in according to this view can be met through the widespread deployment of IT systems, is to connect up these different individuals, allowing knowledge to flow to where it is needed and allowing for "a vast treasure house of knowledge, know-how and best practices" to be exploited rather than remaining untapped (O'Dell and Grayson, 1988, p. 154). As Swan *et al.* (1999, p. 273) suggest, "[c]ognitive, IT-led approaches to KM typically fail to take into account the pre-existing organizational structures, norms and cultural values that lead different groups to have divergent, possibly even irreconcilable, interpretations of what needs to be done and how best to do it. They unrealistically assume

that building networks that provide structural links between these different groups will somehow automatically produce knowledge creation and sharing". Neither of the above approaches is able to depict the socially and materially situated character of cognition as a dynamic and relational process that is not something that purely goes on 'in the heads' of individuals, nor is a wholly collective phenomenon where the individual is effectively submerged within an ostensibly coherent and seamless collective agency.

2.3 Positivism and the Experimental Approach

A final limitation of orthodox cognitive psychology that has been imported into the literature on organisational knowledge and learning, more strongly in some quarters than others, concerns a positivist orientation towards collecting and analysing empirical evidence. This tends to reinforce the pronounced individualistic, static, and functionalist perspective already evident in the way that organisational knowledge and learning are conceptualised by cognitive approaches. This is particularly evident in those approaches that have adopted the same emphasis on experimental and simulation-based methods as the cognitive psychology literature from which they draw inspiration. While not denying the potential usefulness of such techniques, it is also crucial to acknowledge their limitations. Arguably their greatest strength is also their biggest weakness. Experimental and simulation studies are able to provide settings in which variables can be controlled and manipulated to allow the researcher to focus on the role of those that are hypothesised to be of relevance. However, the ability to manipulate experimental settings often comes at the cost of simplification and abstraction. This means that they are typically limited in their ability to emulate the messy complexity of 'intact activity systems' (Greeno, 1998) or cognition 'in the wild' (Hutchins, 1995).

Ever more sophisticated experimental designs can ameliorate the problems of simplification and abstraction, but there are more inescapable features of such approaches that make them less suited for investigating the dynamic, unfolding, situated, context-dependent, and complexly interconnected processes of knowing and learning in practice. The main problem is that such approaches tend towards reductionism in assuming that organisational cognition can best be understood by subdividing it into simpler components, factors, or variables that can then be reassembled to form a complex whole. The aim of experimental approaches is to manipulate conditions so as to isolate one or a few features of interest. For some, this is not considered problematic, either because there is thought to be a sufficient degree of resemblance between the experimental setting and non-artificial situations despite the decomposition and separation of 'factors'; or alternatively features of the real world are simply not seen to be relevant to the phenomena being studied. For example, Vera and Simon (1993, pp. 42-43) argue that for "many purposes of cognitive simulation, it is of no special significance that thought is social. So long as a system is provided with a knowledge base that corresponds with the relevant knowledge possessed by the person who is being simulated, one need not be concerned with the original source of that knowledge". However, others remain unconvinced by these arguments. For instance, Greeno (1998, p. 7) has observed that "[e]xperimental conditions are arranged to provide information about one of the processes of perception, comprehension, memory, inference, or judgement, assuming that the influence of other processes can be neglected in drawing conclusions about the process that the experiment was designed to investigate".

The problem is that by isolating factors, treating them as discrete and independent variables to be manipulated under experimental conditions, almost invariably encourages them to be hypostatised. At worst this means that actors (whether individual or organisational) are themselves treated as bundles of individual characteristics, the presence or absence of which in different combinations, and given alternative environmental conditions and stimuli, together influence behaviour. Although it is not logically necessary for such studies, once organisations, individuals, and situations are reduced to a series of component parts, the emphasis is typically a narrowly functional one, investigating the effects and outcomes of these characteristics rather than considering how such features are constituted nor how they change and evolve. The individual characteristics and traits of cognitive agents come across as static attributes rather than actively and historically constituted elements. Another tendency that seems to follow from such atomistic thinking is that of treating actors and the settings within which they act and interact in strongly dualistic terms, with contexts or environments forming a passive and container-like backdrop to organisational action.

3 PRACTICE-BASED APPROACHES TO ORGANISATIONAL KNOWLEDGE AND LEARNING

Having looked at some of the main features and limitations of the cognitive tradition in the literature on organisational knowledge and learning, I would now like the consider the key benefits, but also disadvantages and omissions, of practice-based approaches. Although the latter are keen to distance themselves from cognitive explanations, I nevertheless argue that the two approaches are by no means as incompatible as is often claimed and that a fruitful dialogue could and should be established between them. The strength of practice-based approaches is that they strive to offer a holistic understanding of knowing and learning as dynamic, emergent, social accomplishments that are actively situated within specific contexts of practice. Consequently, they are able to counter some of the tendencies observed above in cognitive approaches towards depicting knowledge and learning in static, dualistic, internalised, and ultimately individualised terms. According to Lave and Wenger (1991, pp. 50-51) "a theory of social practice emphasizes the relational interdependency of agent and world, activity, meaning, cognition, learning, and knowing. It emphasizes the inherently social negotiated character of meaning, and the interested, concerned character of the thought and action of persons-in-activity". Similarly, Gherardi (2001, p. 134) has argued that "when the locus of knowledge and learning is situated in practice, the focus moves to a social theory of action that addresses activity and passivity, the cognitive and the emotional, mental and sensory perception as bits and pieces of the social construction of knowledge and of the social worlds in which practices assume meanings and facticity". Thus, a crucial feature of these approaches is a shift in focus from 'cognition in the head' to 'cognition in practice' (Lave, 1988).

The emphasis is on the socially constituted, indeterminate, revisable, and negotiated character of knowledge. This is in contrast to representationalist approaches that believe in the possibility of a mirror-like correspondence between external, independent phenomena and the mental structures and language used to represent them. Practice-based approaches are deeply critical of this, presenting instead a relational and process-orientated view of the mutually constitutive nature of social phenomena which makes it meaningless to speak of them independently. As Lave and Wenger (1991, p. 51) put it, "the socially and culturally

structured world … is socially constituted; objective forms and systems of activity, on the one hand, and agents' subjective and intersubjective understandings of them, on the other, constitute both the world and its experienced forms". It is from recognising the mutually constituted character of knowledge and practice that questions of context, situation, and setting come to the fore. This is because at "issue here is not knowledge as a self-standing body of propositions but identities and modes of action established through ongoing, specifically situated moments of lived work, located in and accountable to particular historical, discursive and material circumstances" (Suchman, 2000, pp. 312-313). Once again there are important differences here with the cognitive approaches outline above which tend to treat the context or setting of organisational actions as a static, container-like backdrop. Practice-based approaches conceptualise context not simply as a container within which activities occur, but as crucially enacted whereby its elements are simultaneously influence on, medium of, and outcome of social activity.

One of the key advantages of practice-based approaches is that they seek to provide a historically situated account of practices, acknowledging that they follow complex and sometimes contradictory trajectories. This is in opposition to some branches of the cognitive tradition that appear to portray organisational knowledge and learning as driven by universal and immutable tendencies, and thus as effectively ahistorical. However, I would argue that the anti-cognitive bias in practice-based approaches is both unnecessary and ultimately limiting. One does not have to abandon any reference to cognition in order to avoid those pitfalls of cognitive approaches that practice-based theory so eloquently highlights. Indeed, by being excessively reticent to speak of cognitive processes, practice-based approaches have closed down a fruitful avenue of investigation that may offer a more detailed understanding of how practices are constituted, reproduced, and transformed than they have so far been able to offer. Although there are those who doubt the potential of integrating sociological styles of interpretation - which practice-based theories typically draw upon - with cognitive approaches (e.g. Woolgar, 1995), there have nevertheless been some that have been working towards precisely such a rapprochement (e.g. Cicourel, 1973, 1981; Greeno, 1998; Zerubavel, 1999). There are a few practice-based theorists who have taken steps in this direction, notably the work of Orlikowski and Gash (1994) on technological frames, but such attempts have generally been few and far between.

It is worth acknowledging that the practice-based critique of cognitive approaches is perhaps rather ingenuous, based as it is upon something of a caricature of the latter. Certainly by using the rhetorical device of setting themselves up in opposition to 'conventional' or 'traditional' cognitive theories, practice-based arguments are able to make their arguments stronger and more distinctive. There is, however, a question mark over whether the rhetorical benefits of a thoroughgoing rejection of cognitive approaches does not come at the expense of ignoring any useful insights from this body of work at all. Practice-based approaches are reticent about making reference to patterns, frameworks, or models of thinking, collective or otherwise, for fear of veering towards representationalism and mentalism (e.g. Gherardi, 2006; Lave and Wenger, 1991). However, one does not have to accept a representational or mentalist position to draw conceptual benefit from the notion that patterns of collective activity are, to some extent at least, enabled and guided by interlocking cognitive schemas that are, to a greater or lesser degree, generated, reproduced, and modified by people participating in joint activities. Indeed, there is much to be gained for practice-based approaches in taking on board ideas from social cognition because it is arguably in the study of the interplay between individual and socially overlapping

knowledge frameworks that important steps can be taken towards understanding the different circumstances under which practices are reproduced or transformed. In opposition to the representationalist tendencies of the information processing view, taking such an interpretative perspective on cognition connects much more closely with many of the traditions from which practice-based theory draws, including pragmatism, phenomenology, symbolic interactionism, and social constructionism. As such, it offers an appropriate route for pursuing a rapprochement between practice-based and cognitive approaches. Instead of viewing cognition in terms of the rule-based processing of information as representations of reality, the emphasis shifts to the role of interpretative schemas in guiding how unfolding social realities are constituted and enacted. Schemata provide the crucial link between past, present, and future in these processes, permitting practices to be reproduced but also potentially transformed, and thus allowing genuine agency without voluntarism and regularities of action without determinism. The next section considers some of the theoretical possibilities and challenges of integrating cognitive and practice-based approaches.

4 COGNITION IN PRACTICE: TOWARDS AN INTEGRATION

Fortunately, the theoretical foundations upon which practice-based theories of organisational knowledge and learning stand provide a solid starting point from which to develop a more socially and historically situated understanding of cognition. Practice-based approaches are often themselves inspired by a sociology of practice (e.g. Bourdieu, 1977, 1990; Garfinkel, 1967; Giddens, 1979, 1984), and contributions such as these have been rather less reticent to invoke cognitive processes, even if they do not fully elaborate how they fit into their explanatory frameworks. For example, Giddens (1979, 1984) emphasises the knowledgeability of actors, highlighting the need for a knowledge of the rules, conscious or otherwise, to make people capable of action (c.f. Sewell, 1992). Structuration theory makes reference to memory traces and pre-existing interpretative schemes as carriers that permit the reproducibility of practice. However, it is not always clear the precise role these play and whether they can be conceptualised as having a cognitive dimension. There are some who are unwilling to concede the possibility of recurrent practices, or scripts, being guided by cognitive frameworks. For example, Barley and Tolbert (1997, p. 98, emphasis in the original) have argued that "it is empirically more fruitful to view scripts as behavioural regularities instead of mental models or plans. From this perspective, scripts are *observable, recurrent activities and patterns of interaction characteristic of a particular setting*". However, this does not address how such patterns are actually formed and reproduced and it is here that I would suggest socially shared cognitions play a crucial part in guiding practices. To claim the relevance of cognitive frameworks for reproducing social practices is in no way inconsistent with the crucial argument that such frameworks for knowing are embodied, inhere in, and are variably distributed across, specific social and material settings in which practices are actively situated. To talk about schemata, mental models, and so on, does not have to conjure up images of knowing as taking place solely 'in-the-head'. However, this does not mean that one has to deny any role for knowing-in-the-head for fear of mentalism. This is providing, of course, that one does not make the mistake of depicting cognition entirely as an individual, internalised, rational, impassive, and dispassionate activity.

Moreover, there are lessons from social cognition, in terms of the interplay between individual and collective knowledge and between automatic and active modes of cognition that can begin to address some of the key problems that a sociology of practice has been attempting to solve, arguably without total success (e.g. Louis and Sutton, 1991; Schwarz, 1998). One of the most difficult of these is the question of how, once rules or patterns of recurrent action are established and effectively reproduced, they can be modified and transformed. Contributions to a sociology of practice have tended to focus more on the conditions underlying the reproducibility of practice than its transformation. This is probably most evident in the work of Bourdieu (1977, 1990) where practice is depicted as taking place within a particular habitus. The latter is defined as "an acquired system of generative schemes objectively adjusted to the particular conditions in which it is constituted … engender[ing] all the thoughts, all the perceptions, and all the actions consistent with those conditions, and no others" (Bourdieu, 1977, p. 95). Given such a conceptualisation it is difficult to see how transformations are possible.

Other work that has informed a sociology of practice, such as ethnomethodology, has been more open to the twin character of social practices as offering both the potential for routinisation and transformation. While not denying that large elements of action, particularly in organisational settings, are routinised, relatively unreflexive, and grounded in taken-for-granted assumptions, this does not mean that the totality of behaviour is entirely automatic and habitual. People are not 'cultural dopes', simply acting out established norms and patterns of behaviour (Garfinkel, 1967). Certainly, as Garfinkel's so-called 'breaching experiments' clearly demonstrated, there is a considerable amount of 'work' and implicit background knowledge that goes into sustaining even the most trivial of everyday activities that only comes to the surface when there is a breakdown, in the case of these experiments by purposefully breaching the expected rules of conduct. However, this does not mean that social action is entirely and unchangingly rule-bound in the sense that there is no escape from collectively sanctioned norms of conduct. For Garfinkel (1967), the potential for improvisation and autonomous action comes from the very fact that social rules have to be actively constituted and that a considerable amount of, generally unacknowledged, effort goes into reproducing them. They may seem to be self-evident, immutable, and natural states-of-affairs, but they are nonetheless the product of concerted human action. This is not dissimilar to the discussion of reification in social constructionism (Berger and Luckman, 1966). Being the product of human action, rather than fully naturalised categories, social rules and norms always contain the potential, however infinitesimal, for their own transformation.

This potential for transforming social rules and norms has been directly recognised by a number of practice-based organisation theorists. As Gherardi (2006, p. 29) has commented, "social norms are indexical, with the consequence that a rule of behaviour does not have a univocal meaning outside the concrete settings where it is applied. This thesis stresses in particular that the range of application of a rule is always constituted by an *a priori* indefinable number of different situations, so that a norm is always applied 'for another first time' … and a routine work practice is always executed for 'another first time'". Similarly, Feldman and Pentland (2003) have highlighted the partly reflective and performative character of rules and norms of conduct as a way of exploring the interplay between the reproducibility and transformability of routine practices. They use the distinction between ostensive and performative forms of power specified by Latour (1986) to offer a reworking of the notion of organisational routines. According to their definition,

the "ostensive aspect is the ideal or schematic form of a routine. It is the abstract, generalized idea of the routine, or the routine in principle. The performative aspect of the routine consists of specific actions, by specific people, in specific places and times. It is the routine in practice. Both of these aspects are necessary for an organizational routine to exist" (Feldman and Pentland, 2003, p. 101). Accordingly, rules and norms in their formal or ostensive sense can never be all-encompassing because they always rely on being enacted through performances.

However, what has received less attention in these accounts is the notion that the performance of rules and norms by necessity relies upon an active, if often implicit, background of interpretations and assumptions, in an ongoing flow of mutually constituting interactions. These are needed to reproduce normative behaviour to give it its regularised character, but also offer the potential for its transformation through unintentional modifications and the reflexive self-monitoring of more conscious agency (Emirbayer and Mische, 1998). A key issue here is not only that individuals are active agents in the reproduction and potential transformation of social rules and normative expectations, but also that the process of fitting together norms, dispositions, and situations is a crucially interpretive accomplishment. In order to orientate their behaviour by calling upon different normative or dispositional elements that are more or less appropriate to the situation, individuals must first make sense of the what the situation is, often on the basis of quite fragmentary, fleeting, and incomplete evidence. How one makes sense of situations is, in turn, influenced by what Hochschild (1979) called 'framing rules' and Cicourel (1973) termed 'interactional competence'. In either case it is not only knowledge of the rules that is needed, but also a practical sense of how and where they can be applied. For Cicourel (1973) there is a crucially cognitive dimension to the ability to generate situationally appropriate actions in that both normative expectations and the understanding of situations are guided by interpretive schemata.

This is something that practice-based approaches, and sociology more generally, have avoided recognising. Yet, as Sewell (1992, p. 7, emphasis in original) has argued in relation to structuration theory, this leads to something of an omission: "Giddens places a great deal of weight on the notion that actors are *knowledgeable.* It is, presumably, the knowledge of rules that makes people capable of action. But Giddens develops no vocabulary for specifying the *content* of what people know". Cicourel (1981, p. 101) has made much the same point in suggesting that "[t]aking seriously the notion of schema theory should force sociologists to recognize the necessity of an explicit theory of meaning. Sociological theory often treats meaning as obvious or as a residual category". Using the example of the constitution of project management practices in consulting engineering, the next section offers an illustration of how the interplay of interpretative schemata, norms, and situations can be approached empirically. This provides an opportunity to reflect upon not only the conceptual challenges of integrating cognitive and practice-based approaches, but also the non-trivial issues of method that arise when attempting such an integration.

5 REPRESENTING AND PERFORMING PROJECT WORK: AN ILLUSTRATION

This illustration is drawn from a study currently being conducted by the author into the practices of multi-functional project teams. It focuses on one of two teams being studied

through a combination of ethnographic observation and other methods for investigating patterns of team knowledge, such as cognitive mapping and documentary analysis. The team in question, which undertakes capital projects in the utilities sector, has members representing different functions, roles, disciplines, and organisational affiliations. It is responsible for delivering an extensive series of projects over a five year period as part of a large capital investment programme. In terms of the methods chosen for the study, a multi-method case study approach was selected as an appropriate way of addressing the research questions. The two principle methods used are ethnographic observation and cognitive mapping which, despite making strange bedfellows, arguably offer complementary insights that partly counteract each other's weaknesses.

There is a tendency in practice-based theories to assume that the intelligibility of situated practices can mainly be grasped through observation. This is founded on an argument drawn from ethnomethodology where the indexicality of practices, in which their meaning is tied to specific contexts of action, is such that those participating in them are able to, and routinely do, provide their own accounts of what they do. This offers a foundation for reflexive action, but crucially also, so the argument goes, allows external observers to reconstruct the meaning of practices through observation. While ethnomethodology can be criticised for exaggerating the transparency of practice to those involved, and particularly to those outside a given field of practice, there are nevertheless key benefits to approaches based on the longitudinal observation of, and engagement in, activity settings for investigating knowledge-in-action. Without becoming deeply embedded in the setting being studied it is difficult for the researcher to appreciate the context-specific, localised, and emergent character of practices. To this end, the research has involved repeated visits to the various team locations to observe the day-to-day activities of its members, particularly in their formal and informal interactions. To date this has involved around 45 days contact with the team over a twelve month period, with visits to the other case study team being conducted partly in parallel. As well as detailed notes and, where possible, direct transcripts of meetings held for a variety of reasons (from team level discussions to detailed planning, progress, design, and implementation meetings), a fieldwork diary was kept for each visit containing a record of observations, conversations, and other points of potential interest. As far as possible, this has been based on an attempt not to pre-select and censor events that only meet my preconceptions about the setting I am trying to understand. This is frequently easier said than done and conscious efforts need to be made to counteract the influence of familiarity on observations as the amount of contact time with the team increases. The danger here is that with the growing routinisation of research interactions over time it also becomes more difficult to appreciate the recurrent character of those team practices that are the target of the research.

Contrary to the assumption often found in practice-based approaches that observation is the only secure route to comprehending a field of practice, I would suggest that social practices are often more opaque to outsiders than frequently claimed. The previous point about the researcher becoming absorbed in the taken-for-granted nature of a practice indicates the paradoxical nature of observational research. Familiar to anthropologists, the paradox is that in order to understand the rule-based and routine nature of practices, the researcher must allow him or herself to become, at least partly, engaged in those practices and thus risks treating them in the same taken-for-granted way as the research participants under study. With minimal engagement, the researcher is presented with a potentially bewildering series of obscure activities and the danger is that their meaning is interpreted

solely according to the researcher's existing conceptual schemas. However, by developing the degree of engagement required to begin to understand the meaning of practices as it appears to those involved in them, it becomes likely that the more routine or 'normal' activities go unobserved as they no longer have the capacity through unfamiliarity to capture the attention.

Recognising the challenges and limitations of observational work, the study has also drawn on other methods, particularly cognitive mapping, as a technique for eliciting team members' perspectives on project work. Using the issue of what constitutes and differentiates 'good projects' and 'bad projects' as an opening thematic prompt, team members are asked to construct cognitive maps of their immediate responses to this theme side-by-side with the researcher using the mapping software package Decision Explorer™. So far 30 mapping interviews have been conducted, each lasting around 1-1½ hours, and I am currently involved in repeat interviews with those participants who are still available to see the extent to which their thematic priorities have changed over the intervening period of several months since the original mapping exercises were undertaken. For each of the mapping interviews, the emphasis was on minimising the amount of prompting provided to participants beyond explaining the mechanics of the mapping process, introducing the initial thematic prompt, and clarifying the wording of the concepts as they were recorded by the researcher using, as far as possible, the respondent's own words. Audio recordings and transcriptions of both the initial and follow-up interviews have been made, providing an important cross-reference during the subsequent analysis of the resulting maps (see Figure 1 for some examples of maps generated with team members).

The status of the representations developed through cognitive mapping in its various forms have been the subject of vigorous debate (e.g. Bougon, 1992; Daniels and Johnson, 2002; Hodgkinson, 2002; Scheper and Faber, 1994). While this is by no means inevitable, cognitive mapping is frequently associated with some of the less beneficial characteristics of conventional cognitive psychology, as outlined above. In other words, there is the danger through cognitive mapping of promoting a static, individualistic, and representationalist view of knowledge, often accompanied by a strongly positivist and functionalist research orientation. At its most extreme, there is the risk of conflating cognitive maps as verbal and visual representations of ideas or perspectives, with cognitive maps as a metaphor for heuristic and schematically guided processes of perception and interpretation. At best, as Swan (1997) has observed, cognitive maps are representations of representations, and incomplete and fragmentary ones at that. However, as a corollary of my suggestion that to draw on insights from the cognitive tradition does not have to mean that one accepts all its attendant problems, providing its limitations are acknowledged, cognitive mapping can be used as an effective method for gathering perspectives about a particular domain. This does not inevitably mean that the method has to be used in a static, functionalist, and positivist way.

By treating the resulting representations generated from the mapping sessions not as final and definitive mirrors of an individual's thinking, but rather as partial, provisional, and revisable documents charting a person's perspectives on a given theme at a specific point in time, many of the above difficulties fall away. The resulting cognitive maps are not an end-product, as they appear to be treated in some studies, but instead take the form of incomplete markers that can be positioned and compared relative to the activity setting of the respondents. Without this they remain abstract and fixed with no sense of how they are

mutually constituted in practice. This is where the ethnographic element of the research comes back in. By taking a multi-method approach, it is possible to use cognitive mapping in a much more situated and dynamic way than has usually been the case, while at the same time providing another window into the nature of practice that does not depend entirely on insights drawn from observation. The following examples are drawn from both elements of the study and the crucial attempts to trace out the connections between them.

5.1 Schemas of Project Work

One of the key rationales behind using a cognitive mapping approach has been to attempt to identify if there are any patterns or regularities in the ways that multi-functional project team members represent the nature of their work. A major methodological challenge here has been how to make meaningful comparisons across what are quite individual and idiosyncratic maps. The relative benefits and disadvantages of ideographic (as employed in this study) as opposed to nomothetic mapping techniques has been a major topic of discussion in the study of organisational cognition (e.g. Daniels and Johnson, 2002; Hogkinson, 2002). The main problem with comparing cognitive maps collected using an ideographic approach is that, with fewer limits on what concepts respondents are able to talk about and an emphasis on allowing them to express themselves in their own words, the researcher is left with the potentially enormous task of painstakingly examining and cross-checking each concept and the relationships between them manually rather than with the aid of, at least partly, automated analytical techniques to which nomothetic approaches lend themselves more readily. However, for the purposes of the present study, where it has been important not to impose *a priori* limitations on the concepts employed by respondents so as not to eliminate potential points of difference, the challenges of analysing ideographic cognitive maps were judged to be a worthwhile price to pay for addressing the research questions. In order to make a comparative analysis possible, the maps have been subject to qualitative interpretation and coding using an emergent and iterative coding scheme that is still being refined as further data are collected. The aim of the coding has been to reduce the overwhelming number of concepts elicited through the mapping by grouping them into overarching themes. Thus, where it is possible to detect thematic similarities between the concepts used by respondents, despite precise variations in wording and forms of expression, these have been grouped together under a more inclusive label.

The next stage in the analysis has been to identify patterns across these themes to see where team members agree and disagree on their perspectives of project work. The coding has also been used as the basis for a cluster analysis to explore whether there are regularities of response between specific segments of the project team according to potential bases of identity construction (e.g. role, discipline, organisational affiliation, educational background, age, gender, etc.). However, the results of that aspect of the research will not be reported here. Instead, I would like to concentrate on the overall degree of overlap (or otherwise) in team members' perspectives on project work and how far they coincide with orthodox images of project management without going into detail on patterns at the sub-group level. The idea is to give some indication of the extent to which the typical norms of project work are apparent in the concepts that project members articulate in their self-characterisation of what they do. I will discuss some important caveats regarding the status and interpretation of these data in due course, but leaving those aside for the time being the indications emerging from he mapping side of the study are as follows.

Based on the coding of concepts from the maps collected from a cross-section of team members, Figure 2 depicts the degree to which thematic areas are shared across the team. It should be evident from the overall character of themes covered that there is a fairly strong appearance of those supporting a technical, rational, and instrumental view on project management. However, perhaps the most telling indications of this come from those themes that are shared by the majority of maps. Here the usual preoccupations of project management thinking come to the fore, not least the 'iron triangle' of time, cost, and quality. Having said that, it is worth noting that time and cost, the pre-eminent pillars of managerial instrumentalism, actually make an appearance in more project members' maps of project work than does quality. Other popular themes that are in line with conventional project management thinking include: planning, control and monitoring; issues about scope of work and establishing a clear direction to follow; processes, standards, and regulations; resource allocation; a focus on delivering actions, outcomes, and outputs; and so on. Not all the central themes are quite so technically-orientated but are arguably equally rational and instrumental in flavour. These include issues about staffing and personnel, such as team selection and role allocation; how to motivate the team through appropriate incentives; how to organise and arrange team relationships to promote enhanced performance; and how to streamline communications between different parties.

While the themes in the middle of the diagram give an indication of the issues around which there appears to be team consensus, suggesting the existence of collective norms surrounding what is involved in project work, it is important not to forget the widely ranging collection of themes arrayed around the edge that are shared by a smaller proportion of the maps. Admittedly many of these are subsets or elaborations of what tend to be more abstract and generalised categories in the centre (e.g. 'deadlines and milestones' are a sub-category of 'time and programme'). This means that it is little surprise there is less overlap because they are simply specific and more individualised instances of the global project management topics that dominate the middle. However, it does also underline the overall technical, rational, and instrumental flavour of the concepts covered by the maps. Further refinements of the coding scheme will concentrate on clarifying the hierarchical relationships or nesting between themes to address potential difficulties in adequately charting the shared occurrence of themes across all the different maps. However, it should be clear that some of the outlying themes are less readily subsumed under the more generic issues that have been more regularly referred to by respondents. Some interesting examples include: innovation and new ideas, learning, responsibility and accountability, environmental issues, emotional issues, and help, advice, and mentoring. While, of course, it is entirely possible to take a quite instrumental view on each of these themes, to the extent that they could be the target of purposeful manipulation to enhance project delivery, they are perhaps less obviously in the mould of orthodox project management thinking. An important question arising from this is whether the patterning and distribution of themes across the maps supports the view of conventional project management ideas being normalised to the extent that such views are broadly shared by most people in the team. Certainly the initial indications are that this is the case, with the more popular images of project work being quite orthodox while other perhaps less conventional themes are not shared so widely.

5.2 Performing Project Management Schemas

Having seen strong indications from the case study team members' cognitive maps of quite orthodox norms of project management thinking, a major question arises as to how far such schematic assumptions about their work guides their conduct in practice, and equally how their everyday practices shape their perspectives of what they do. From the earlier discussion about the performative and open-ended character of norms and rules of behaviour, it should be clear that they are not universal and unchanging, but rather actively, and often incompletely, constituted through situated practices. It would, therefore, be surprising to find the complete penetration of a field of practice by a single, all-embracing form of rationality, such as that represented by orthodox schemas of project management. Some counter-currents to the dominant images of project management have already been seen in the themes emerging from the maps in the form of concepts and issues that do not comfortably fit the collective norms. Indications from the observations of team practices are equally ambivalent, if not more so.

Certainly there are clear outward signs of conventional project management thinking observable in the case study setting. These include the usual techniques of control and ordering, such as detailed project procedures that follow a linear stage model, Gantt charts and other tools for planning time and resources, and regular meetings and documentation processes designed to report on, monitor, and adjust progress. Many of these tools and procedures are formally prescribed and codified in considerable detail within the company's IT systems. Here the standard project process, with its clear sequence of stages, milestones, and decision points for technical and financial approval, are laid out. Underneath these are then arrayed a progressively more elaborate hierarchy of work instructions describing in minute detail the actions that need to be undertaken within each stage of the project. However, from observing the behaviour of the team as they perform tasks specified by this overall sequence, it quickly becomes clear that such norms of project practice are not undertaken automatically and without reflection and critique. Indeed, it is evident that many team members display a quite ambivalent stance to the formal project procedures, combining elements of frustration and cynicism about their precise form, while at the same time usually complying with their underlying logic by leaving the fundamental existence of such features as a clear sequence of project stages largely unquestioned.

For example, at a presentation on how to use the project extranet, the presenter – a programme manager from another team – demonstrates a link within the system to the company's formal project stage model. One of the design engineers points out that this is not actually the sequence of events that happens within his team. Due to differences in the contractual arrangements for the type of work undertaken by the team, detailed design and one of the project stage gates are in a different place than indicated in the model. The presenter says that the diagram was created from the point of view of the work undertaken by his team and other teams involved in similar work and admits that it does not reflect what happens in all parts of the company. The engineer asks whether it would be possible to modify the diagram to reflect this. The initial response of the presenter is as follows: "I'm happy to change it, but I'm just saying there's half the company it applies to and half that it doesn't and you're unfortunately in the half that it doesn't". Another design engineer then asks whether it might not be possible to show within the existing diagram that there are actually two somewhat different stage models relevant to different teams in the company. The presenter agrees to look into this. What this short episode suggests is that

there is an acknowledgement of the limitations and contradictions inherent in attempts to establish formal project procedures.

Contrary to the universalising impulses of project management contained in the logic of a fixed sequence of project stages applicable to all projects, the engineers in the exchange above clearly recognise that there needs to be some flexibility in this sequence. If they were actually to follow the formal procedures for project stages as encapsulated in the project extranet to the letter, they would end up carrying out activities that were inappropriate for the nature of the work that they do and, paradoxically, undermine the performative intentions of having formal procedures. Instead of being an innate, naturalised, and immutable element of project work, the 'project stage process' is problematised as a context-dependent device whose constitution depends crucially on social and political influences. The fact that the general project stage model for the company takes the particular form that it does speaks volumes about the relative position and interests of those responsible for its design. The model has been created around the specific needs and activities of this group and then presented as the definitive company procedure without, it seems, even realising that there might be limits to its applicability across different areas of the company. By questioning the relevance of the stage model to their own activities, the members of the case study team are opening up some cracks in the rationalistic veneer of the project stage process, not to question the overall existence of some form of project staging, but to assert the local character of their practices by declaring that this is not the way that things are done around here.

Another example of the often critical way in which team members reflect upon formal procedures is provided by a discussion I had with a design engineer who had recently joined the team from a company-level programme for defining and implementing a range of process improvement projects. He described how this improvement programme was strictly based around the PRINCE2 (PRojects in Controlled Environments) project management methodology (OGC, 2005). This is a tightly sequential and carefully controlled process-driven approach to project management that involves the initial formation of a Business Case and its subsequent review on a regular basis. The engineer commented on how he thought the documentation requirements for this approach are excessive and that the procedures are generally too cumbersome for most activities. He went on to say that the use of a high profile approach, such as PRINCE2, which attempts to present itself as the current best practice for managing projects, is probably being used by the company's process improvement programme less as a workable approach and more as a visible display of their being at the cutting edge in project management terms and a justification for the resources they have been given to undertake their work. He outlined two reasons for this. Firstly, the improvement programme is mostly staffed by people who have not come from an engineering or project background and so he thinks that they may be keen to demonstrate their project management credentials within an organisation that overall has a strong technical orientation. Ironically, by choosing a methodology that many practising project managers and engineers within the engineering side of the company consider to be overly complicated and bureaucratic, the result has arguably been the opposite of that intended by the process improvement team. Rather than demonstrating their legitimate membership within the project management community, they have unwittingly set themselves apart. This is because their slavish following of PRINCE2 principles appears in stark contrast to the more experience-based, rule-of-thumb, and commonsensical image of practice that the established project management community

within the company likes to portray. Secondly, having made a number of "quick wins" in improving processes, the engineer suggested that most of the "low hanging fruit" had been picked and that further measurable improvements would be both less dramatic and slower in coming. He argued that since it was now becoming difficult to prove the outcomes of these improvement projects, more emphasis was being placed on the activities being undertaken rather than their outcomes to demonstrate that something was being achieved. PRINCE2, with its detailed "paper trail" of documentation was, according to the engineer, an effective way of achieving this even if it ultimately did not contribute to the aims of the programme. What is most interesting in this illustration is not that the use of project management discourses as a political tool for legitimating particular activities and access to resources, or as a badge of membership in a given community, can be readily shown to depart from the calmly rational and instrumental image of project management orthodoxy. The more important point is that this critique shows the clear capacity of practitioners to reflect critically upon what they do, in this case demonstrating a less than complete acceptance of conventional project management norms and a clear orientation towards not taking the claims of formally prescribed approaches too seriously.

The above example is by no means an exception in the team. Discussions among team members, both in formal and informal interactions, often involve a questioning attitude towards what might be considered conventional project management thinking. It is in these episodes that one can find indications of multiple rationalities that are often contradictory. Sometimes these contradictions are left untouched, particularly by splitting rationalities into distinct domains (e.g. professional and personal life, work and home, individual and organisation), thus allowing people to cope with the potential conflict. In these instances some norms, values, or beliefs are often privileged while others are allowed to play a less prominent role, a typical example being the self-regulation of personal beliefs that are not thought to be in line with the collective norms of conduct at work (bearing in mind that we have emphasised the provisional and contested character of the latter). In other cases, the tensions can not so easily be contained and erupt into situations where attempts are made to repair and resolve the contradiction.

The following illustration, taken from a discussion at another of the team's monthly meetings, suggests how multiple rationalities are a regular feature of organisational life within the team. In this example, members of the team are discussing the recent requirement introduced by the company to complete a waste management plan when planning their projects. This is being implemented with the intention of reducing the environmental impact of projects through increased on-site recycling of waste materials, reduced landfill, and fewer vehicle movements. A manager has come from the head office to explain the new requirements. Throughout his explanation he repeatedly emphasises how there is a good financial business case for reducing waste. This focus on reducing corporate social and environmental responsibility issues to a financial rationale by portraying such practices as also good for the bottom line is perhaps what one might expect from an orthodox managerialist perspective. However, rather than accept this rationale at face value, different members of the team questioned the way that the changes to waste management procedures were being justified to them. The team leader was particularly vociferous on this point, saying that he would "like to hear the company say this is what you should do because it's the right thing to do" not simply because there is a workable business case for it.

However, at a subsequent meeting a few months later, the issue of reducing the impact of projects on the environment was again raised, except that this time views about the relative priority of such matters had changed quite radically. This was because in the intervening period a major reorganisation had been set in motion within the company with a strong focus on improving efficiency and concentrating only on business critical activities. Each of the project areas was under extreme pressure to show demonstrable improvements and so, to avoid being the target of senior management interventions, the team's management was now retreating into a more conventional position on such things as environmental and social responsibility. The team leader was still keen to promote an ethos where team members are encouraged to think about their wider responsibilities and 'do the right thing', except that now he emphasised that this had to take second place to questions of efficiency. He is keen to justify this change of position, counterposing his own interpretation and beliefs against what are portrayed as the inescapable realities of business:

> "You can't be a company like ours and not have environmental and sustainability objectives … It's the money thing isn't it? How far would you go to pay to have good environmental consequences … So money always comes into it and that's why the word sustainability is always thrown in there because … sustainability doesn't mean saving up things now so that you can use them later on in the day. That's what it should mean. Doing things now that mean we exist and we can function … in the future is what sustainable means in my view. But what it means to us is not doing this if it doesn't pay back. Sustainable … means can the company afford it. Because if it can't afford to do these things even though it wants to do them, it won't exist".

What this example shows is the interplay of quite different rationalities – a more private belief system about environmental sustainability and a more public, role-constrained position that ultimately takes precedence within the changing context of the company's organisational initiatives. The implication is not only that different and potentially competing discourses can coexist within a particular setting of practice, sometimes rubbing up against each other in the form of tensions and contradictions, but also that such discourses and the interplay between them are not static but are instead dynamically constituted and situated within a whole range of other interlocking practices. This is something that is difficult to detect in the earlier cognitive mapping data because, unless repeated at different points in time, they represent a single snapshot of an individual's perspectives on a given set of issues. From this it is easy to assume that all of the perspectives expressed are equally enduring when it is more likely that some will make a relatively regular appearance, at least in some form, in somebody's views over time, while others will be more ephemeral, temporarily reflecting the salient features of the more immediate situation. Thus, while it is possible to detect a continuing concern about not taking an excessively hard-nosed and instrumental position on environmental issues in the team leader's professed views over time, there is an important shift in how these are represented relative to other perspectives. With the changing political climate accompanying the company's reorganisation, the team management's zone of manoeuvre narrows and they self-consciously subordinate their own more personal beliefs to those of an increasingly powerful corporate discourse of efficiency. Despite this, the team leader's strong personal stance on issues other than purely technical efficiency has not been displaced in all instances by the new pressures from the corporate level. Thus, despite calls

from the head office to 'streamline' health and safety procedures in the new efficiency drive, this was not something that he was prepared to compromise on. In direct contradiction to the directive that had been issued he instructed his staff to continue to carry out all existing health and safety related activities and said that he would take responsibility if they ran into any problems by doing this. Once again this highlights the shifting and power-laden tension between alternative rationalities and modes of practice in which the outcomes are never entirely predictable and secure. This is because there is always the scope for some resistance, however small it may be, as people have the capacity to reflect upon and readjust what they do. Certainly this capacity is not unlimited and is crucially constrained by existing patterns and norms of thought and conduct, but it is precisely the fact that such norms need to be actively constituted to be reproduced over time that provides the opening for their potential transformation.

6 CONCLUSION

This paper has put forward the argument that cognitive and practice-based traditions in the study of organisational knowledge and learning both have important contributions to make to our understanding of the field. However, the full potential of these contributions has been hamstrung by a lack of positive interchange between the two traditions. This is because these two broad approaches have typically been presented as incommensurable and so have eschewed the opportunity of learning from each other. What I have argued is that the incompatibility of cognitive and practice-based approaches has been exaggerated and that both have something to contribute to the other. Practice-based theories offer a crucial corrective to many of the weaknesses of the cognitive tradition, including the latter's tendency to portray knowledge in static, individualistic, and representationalist terms. Instead, practice-based approaches have emphasised the dynamic and situated character of knowing in practice as a culturally, historically, and socially constituted accomplishment. However, I have also argued that the criticism of cognitive approaches by practice-based theories relates primarily to only one, albeit dominant, strand of the cognitive tradition based on the idea of information processing and fails to take into account ideas from cognitive psychology that are by no means subject to the same difficulties. In their efforts to avoid mentalism and representationalism at all costs, practice-based approaches have tended to reject any and all cognitive explanations. This is unfortunate because there are insights that practice-based theories can derive from a more socially situated and dynamic understanding of cognitive processes. In particular, the former tend to struggle to provide an adequate account of both the reproducibility and transformability of social practices and it is here that the notion of shared schemas drawn from cognitive psychology can offer fruitful avenues of exploration. I have suggested that schemas are the cognitive equivalent of social rules and norms, and that they are central in underpinning the interpretative competence necessary to constitute, but also potentially transform, situationally appropriate actions. At the same time, the performative dimension of recurrent practices in turn helps to constitute their ostensive or schematic component, reproducing, modifying, or overturning established frameworks and assumptions in an ongoing flow of mutually constituting interactions.

While the integration of cognitive and practice-based approaches presents some important conceptual challenges, it is also crucial not to underestimate the methodological issues associated with bringing the two traditions together. Just as cognitive and practice-based

approaches have tended to pursue quite distinct theoretical programmes, they also typically rely on quite different methods. Using an illustration drawn from a current study I have been conducting, I have attempted to show how in the area of empirical method, as much as theory, there are benefits to be gained from combining the methods of cognitive psychology, in this case cognitive mapping, with those of practice-based approaches, in the form of detailed ethnographies of practice. The illustration shows how multiple methods can provide different lenses on how participants represent and perform their joint activities in practice. Using examples of shared schemas of project work and the extent to which they both constitute and are constituted by the day-to-day working practices of a team of consulting engineers, I have endeavoured to show that the interplay between the two is by no means straightforward. From the cognitive mapping data it appears that team members share a quite similar core of assumptions concerning their project practices, taking the form of rather formal, abstract, and conventional images of project management. However, from the observational data it is clear that these schematic representations offer only an incomplete guide to action, with the nature of project work coming across as considerably more contested and negotiated within different social settings compared with the more definitive and less ambivalent character of individual schemas elicited through the mapping exercises. While the implications of this have yet to be explored fully, there is an interesting mismatch between the project practices of team members and the way that they represent these practices. Such gaps between thinking, saying, and doing are, of course, a regular feature of organisational life, as typified by the distinction drawn by Argyris and Schön (1978) between espoused theories and theories-in-use. This raises important questions about the reasons for such differences and the extent to which cognitive schemata and situated practices are co-conditioning that need to be more thoroughly addressed. Nevertheless, while there is still much to be done in drawing together cognitive and practice-based approaches, and especially in operationalising them empirically, I hope to have shown that the potential benefits to be gained from doing so make the attempt worthwhile.

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REFERENCES:

Abelson, R.P. (1976) 'Script processing in attitude formation and decision making'. In Carroll, J.S. and Payne, J.W. (eds.) *Cognition and Social Behavior.* Hillsdale, NJ: Lawrence Erlbaum Associates, pp. 36-46.

Anderson, J.R. (1983) *The Architecture of Cognition*. Cambridge, MA: Harvard University.

Argyris, C. and Schön, D. (1978) *Organizational Learning: A Theory of Action Perspective.* Reading, MA: Addison-Wesley.

Badke-Schaub, P., Neumann, A., Lauche, K. and Mohammed, S. (2007) 'Mental models in design teams: a valid approach to performance in design collaboration?'. *CoDesign* 3(1): 5-20.

Barley, S.R. and Tolbert, P.S. (1997) 'Institutionalization and structuration: studying the links between action and institution'. *Organization Studies* 18(1): 93-117.

Berger, P. and Luckmann, T. (1966) *The Social Construction of Reality: A Treatise on the Sociology of Knowledge.* Harmondsworth: Penguin Books.

Bougon, M.G. (1992) 'Congregate cognitive maps: a unified dynamic theory of organization and strategy'. *Journal of Management Studies* 29(3): 369-389.

Bourdieu, P. (1977) *Outline of a Theory of Practice.* Cambridge: Cambridge University Press.

Bourdieu, P. (1990) *The Logic of Practice.* Cambridge: Polity Press.

Broadbent, D.E. (1958) *Perception and Communication.* New York: Pergamon Press.

Bruner, J.R., Goodnow, J.J. and Austin, G.A. (1956) *A Study of Thinking.* New York: Wiley.

Cicourel, A.V. (1973) *Cognitive Sociology: Language and Meaning in Social Interaction.* Harmondsworth: Penguin.

Cicourel, A.V. (1981) 'The role of cognitive-linguistic concepts in understanding everyday social interactions.' *Annual Review of Sociology* 7: 87-106.

Cook, S.D.N. and Brown, J.S. (1999) 'Bridging epistemologies: the generative dance between organizational knowledge and organizational knowing'. *Organization Science* 10(4): 381-400.

Cook, S.D.N. and Yanow, D. (1993) 'Culture and organizational learning'. *Journal of Management Inquiry* 2(4), 373-390.

Cooke, N.J., Salas, E., Cannon-Bowers, J.A. and Stout, R.J. (2000) 'Measuring team knowledge.' *Human Factors* 42(1): 151-173.

Craik, K. (1943) *The Nature of Explanation.* Cambridge: Cambridge University Press.

Croy, N., Davenport, T., O'Dell, C. and Ogden, P. (1997) *Using Information Technology to Support Knowledge Management.* Houston, TX: American Productivity and Quality Center.

Daniels, K. and Johnson, G. (2002) 'On trees and triviality traps: locating the debate on the contribution of cognitive mapping to organizational research'. *Organization Studies* 23(1): 73-82.

Descombe, V. (2001) *The Mind's Provisions: A Critique of Cognitivism.* Princeton, NJ: Princeton University Press.

Emirbayer, M. and Mische, A. (1998) 'What is agency?' *American Journal of Sociology* 103(4): 962-1023.

Feldman, M.S. and Pentland, B.T. (2003) 'Reconceptualizing organizational routines as a source of flexibility and change'. *Administrative Science Quarterly* 48: 94-118.

Fiske, S.T. and Taylor, S.E. (1984) *Social Cognition.* New York: Random House.

Garfinkel, H. (1967) *Studies in Ethnomethodolgy.* Englewood Cliffs, NJ: Prentice-Hall.

Gentner, D. and Stevens, A.L. (eds.) *Mental Models.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Gherardi, S. (1999) 'Learning as problem-driven or learning in the face of mystery?'. *Organization Studies* 20(1), 101-124.

Gherardi, S. (2000) 'Practice-based theorizing on learning and knowing in organizations'. *Organization* **7**(2), 211-223.

Gherardi, S. (2001) 'From organizational learning to practice-based knowing'. *Human Relations* 54(1), 131-139.

Gherardi, S. (2006) *Organizational Knowledge: The Texture of Workplace Learning.* Oxford: Blackwell Publishing.

Gherardi, S. and Nicolini, D. (2002) 'Learning the trade: A culture of safety in practice'. *Organization* 9(2), 191-223.

Giddens, A. (1979) *Central Problems in Social Theory: Action, Structure and Contradiction in Social Analysis.* London: Macmillan.

Giddens, A. (1984) *The Constitution of Society: Outline of the Theory of Structuration.* Cambridge: Polity Press.

Gilovich, T., Griffin, D. and Kahneman, D. (eds.) (2002) *Heuristics and Biases: The Psychology of Intuitive Judgement.* Cambridge: Cambridge University Press.

Goffman, E. (1959) *The Presentation of Self in Everyday Life.* Harmondsworth: Penguin.

Gore, C. and Gore, E. (1999) 'Knowledge management: the way forward'. *Total Quality Management* 10(4/5): 554-560.

Grant, R.M. (1996) 'Toward a knowledge-based theory of the firm'. *Strategic Management Journal* 17 (Winter): 109-122.

Greeno, J.G. (1998) 'The situativity of knowing, learning and research.' *American Psychologist* 53(1): 5-26.

Hochschild, A. (1979) 'Emotion work, feeling rules, and social structure.' *American Journal of Sociology* 85(3): 551-575.

Hodgkinson, G.P. (2002) 'Comparing managers' mental models of competition: why self-report measures of belief similarity won't do'. *Organization Studies* 23(1): 63-72.

Hodgkinson, G.P. (2005) *Images of Competitive Space: A Study in Managerial and Organizational Strategic Cognition.* Basingstoke: Palgrave-Macmillan.

Huff, A.S. (ed.) (1990) *Mapping Strategic Thought.* Chichester: Wiley.

Hutchins, E. (1995) *Cognition in the Wild.* Cambridge, MA: MIT Press.

Johnson-Laird, P.N. (1983) *Mental Models: Towards a Cognitive Science of Language, Inference and Consciousness.* Cambridge, MA: Harvard University Press.

Kahneman, D., Slovic, P. and Tversky, A. (eds.) (1982) *Judgement Under Uncertainty: Heuristics and Biases.* Cambridge: Cambridge University Press.

Kelly, G.A. (1955) *The Psychology of Personal Constructs.* 2 Volumes. New York: Norton.

Langan-Fox, J., Code, S. and Langfield-Smith, K. (2000) 'Team mental models: techniques, methods and analytic approaches.' *Human Factors* 42(2): 242-271.

Latour, B. (1986) 'The powers of association'. In Law, J. (ed.) *Power, Action and Belief: A New Sociology of Knowledge?* London: Routledge and Kegan Paul, pp. 264-280.

Lave, J. (1988) *Cognition in Practice: Mind, Mathematics, Culture in Everyday Life.* Cambridge: Cambridge University Press, Cambridge.

Lave, J. and Wenger, E. (1991) *Situated Learning: Legitimate Peripheral Participation.* Cambridge: Cambridge University Press.

Louis, M.R. and Sutton, R.I. (1991) 'Switching cognitive gears: from habits of mind to active thinking'. *Human Relations* 44: 55-76.

McClelland, J., Rummelhart, D. and Hinton, G. (1987) 'The appeal of parallel distributed processing'. In Rumelhart, D., McClelland, J. *et al.* (eds.) *Parallel distributed processing: Explorations in the microstructure of cognition, Volume 1 – Foundations.* Cambridge, MA: MIT Press, pp. 3-44.

Miller, G.A. (1956) 'The magic number seven, plus or minus two: some limits on our capacity for processing information'. *Psychological Review* 63(2): 81-97.

Minsky, M.A. (1975) 'A framework for representing knowledge'. In Winston, P.H. (ed.) *The Psychology of Computer Vision.* New York: McGraw-Hill, pp. 211-277.

Mitchell, R. (1986) 'Team building by disclosure of internal frames of reference'. *Journal of Applied Behavioral Science* 22: 15-28.

Moussavi, F. and Evans, D.A. (1993) 'Emergence of organizational attributions: the role of a shared cognitive schema'. *Journal of Management* 19(1): 79-95.

Neisser, U. (1967) *Cognitive Psychology.* Englewood Cliffs, NJ: Prentice Hall.

Nelson, R.R. and Winter, S.G. (1982) *An Evolutionary Theory of Economic Change.* Cambridge, MA: Harvard University Press.

Newell, A. and Simon, H.A. (1972) *Human Problem Solving.* Englewood Cliffs, NJ: Prentice Hall.

Nicolini, D., Gherardi, S. and Yanow, D. (eds.) (2003) *Knowing in Organizations: A Practice-Based Approach.* Armonk, NY: M.E. Sharpe.

Norman, D.A. (1993) 'Cognition in the head and in the world: an introduction to the special issue on situated action'. *Cognitive Science* 17(1): 1-6.

O'Dell, C. and Grayson, C.J. (1998) 'If only we knew what we know: identification and transfer of best practice'. *California Management Review* 40(3): 154-174.

Office of Government Commerce (2005) *Managing Successful Projects with PRINCE2.* 4th edition. London: The Stationery Office.

Orlikowski, W.J. (2000) 'Using technology and constituting structures: a practice lens for studying technology in organizations'. *Organization Science* 11(4): 404-428.

Orlikowski, W.J. (2002) 'Knowing in practice: enacting a collective capability in distributed organizing'. *Organization Science* 13(3): 249-273.

Orlikowski, W.J. and Gash, D.C. (1994) 'Technological frames: making sense of information technology in organizations'. *ACMN Transactions on Information Systems* 12(2): 174-207.

Porac, J.F. and Thomas, H. (1990) 'Taxonomic mental models in competitor definition.' *Academy of Management Review* 15(2): 224-240.

Rorty, R. (1979) *Philosophy and the Mirror of Nature*. Princeton, NJ: Princeton University Press.

Rosch, E. (1978) 'Principles of categorization'. In Rosch, E. and Lloyd, B. (eds.) *Cognition and Categorization.* Hillsdale, NJ: Lawrence Erlbaum Associates, pp. 27-48.

Rumelhart, D.E. (1984) 'Schemata and the cognitive system'. In Wyer, R.S. and Srull, T.K. (eds.) *The Handbook of Social Cognition, Volume 1*. Hillsdale, NJ: Lawrence Erlbaum Associates, pp. 161-188.

Schank, R.C. and Abelson, R.P. (1977) *Scripts, Plans, Goals and Understanding.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Scheper, W.J. and Faber, J. (1994) 'Do cognitive maps make sense?'. In Stubbart, C., Meindl, J.R. and Porac, J.F. (eds.) *Advances in Managerial Cognition and Organizational Information Processing. Volume 5.* Greenwich, CT: JAI Press, pp. 165-185.

Schwarz, N. (1998) 'Warmer and more social: recent developments in cognitive social psychology'. *Annual Review of Sociology* 24, 239-264.

Sewell, W.H. (1992) 'A theory of structure: duality, agency, and transformation'. *American Journal of Sociology* 98(1): 1-29.

Sher, P.J. and Lee, V.C. (2004) 'Information technology as a facilitator for enhancing dynamic capabilities through knowledge management'. *Information & Management* 41: 933-945.

Sørensen, C. and Lundh-Snis, U. (2001) 'Innovation through knowledge codification'. *Journal of Information Technology* 16: 83-97.

Suchman, L.A. (1988) *Plans and Situated Actions: The Problem of Human-Machine Communication.* Cambridge: Cambridge University Press.

Suchman, L.A. 'Organizing alignment: a case of bridge-building'. *Organization* 7(2): 311-327.

Swan, J. (1997) 'Using cognitive mapping in management research: decisions about technical innovation'. *British Journal of Management* 8: 183-198.

Swan, J., Newell, S., Scarbrough, H. and Hislop, D. (1999) 'Knowledge management and innovation: networks and networking'. *Journal of Knowledge Management* 3(4): 262-275.

Teece, D.J., Pisano, G. and Shuen, A. (1997) 'Dynamic capabilities and strategic management'. *Strategic Management Journal* 18(7): 509-533.

Tolman, E.C. (1948) 'Cognitive maps in rats and men'. *The Psychological Review* 55(4): 189-208.

Vera, A.H. and Simon, H.A. (1993) 'Situated action: a symbolic interpretation'. *Cognitive Science* 17(1): 7-48.

Weick, K.E. (1979) *The Social Psychology of Organizing.* Second Edition. Reading, MA: Addison-Wesley.

Weick, K.E. (1995) *Sensemaking in Organizations.* Thousand Oaks, CA: Sage Publications.

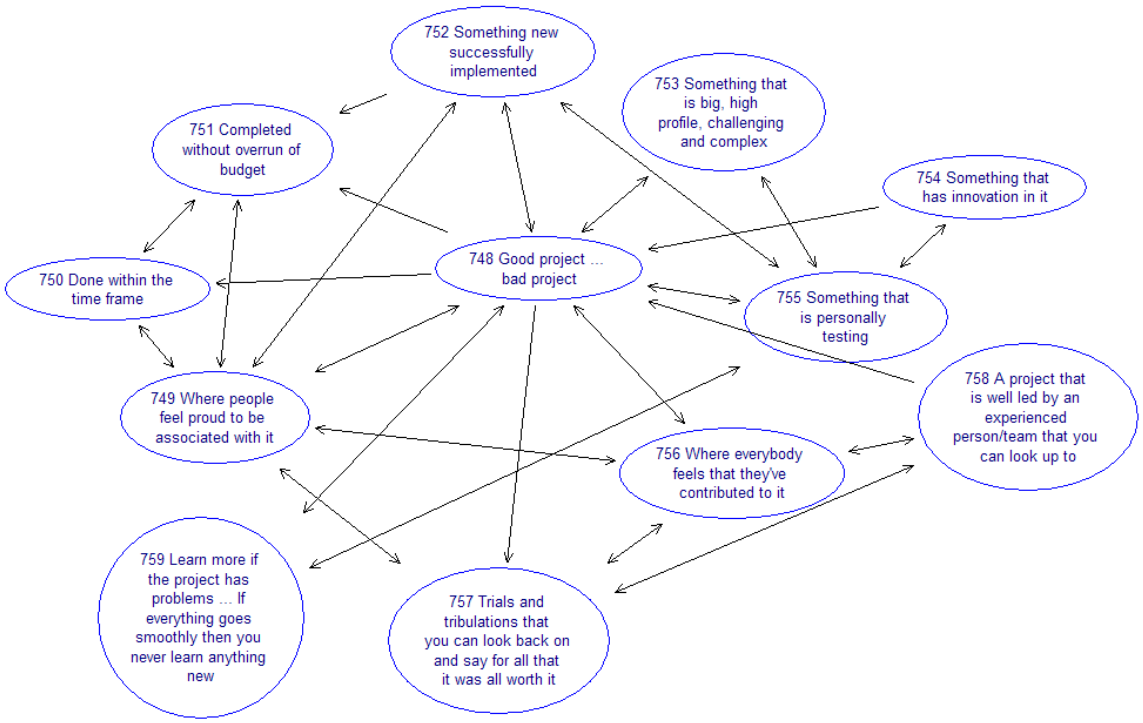
Winograd, T. and Flores, F. (1986) *Understanding Computers and Cognition: A New Foundation for Design.* Norwood, NJ: Ablex.

Winter, S.G. (1987) 'Knowledge and competence as strategic assets'. In Teece, D.J. (ed.) *The Competitive Challenge: Strategies for Industrial Innovation and Renewal.* Cambridge, MA: Bollinger, pp. 159-184.

Woolgar, S. (1995) 'Representation, cognition, and self: what hope for an integration of psychology and sociology?' In Star, S.L. (ed.) *Ecologies of Knowledge: Work and Politics in Science and Technology.* Albany, NY: State University of New York Press, pp. 154-179.

Zerubavel, E. (1999) *Social Mindscapes: Invitation to Cognitive Sociology.* Cambridge, MA: Harvard University Press.

Example 1



Example 2

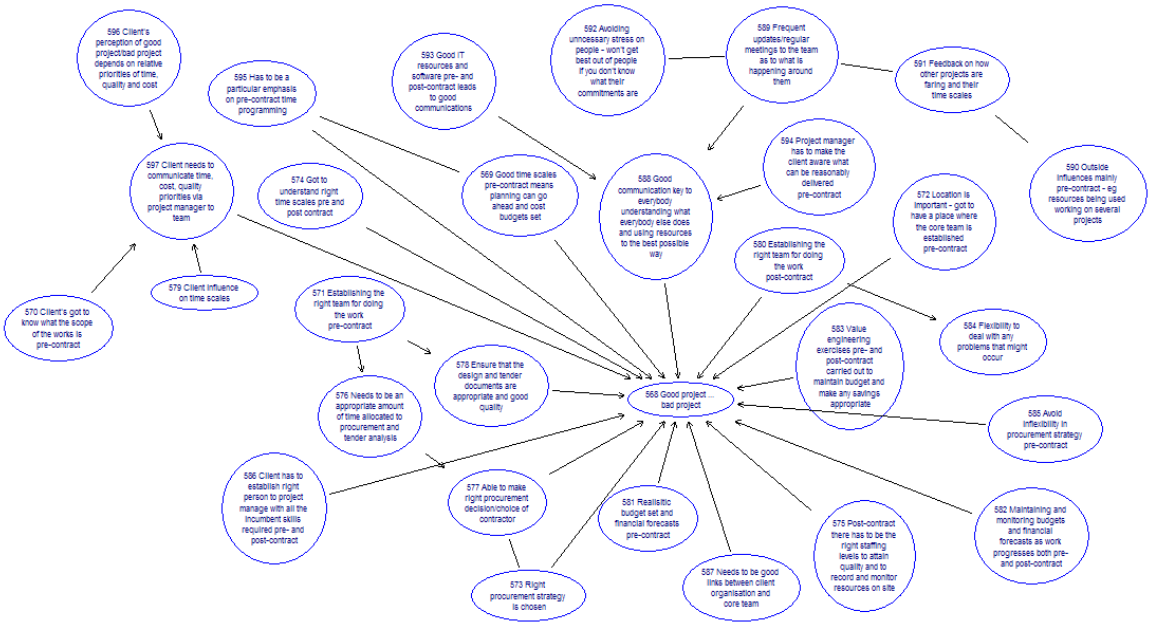


Figure 1: Examples of Team Member Cognitive Maps

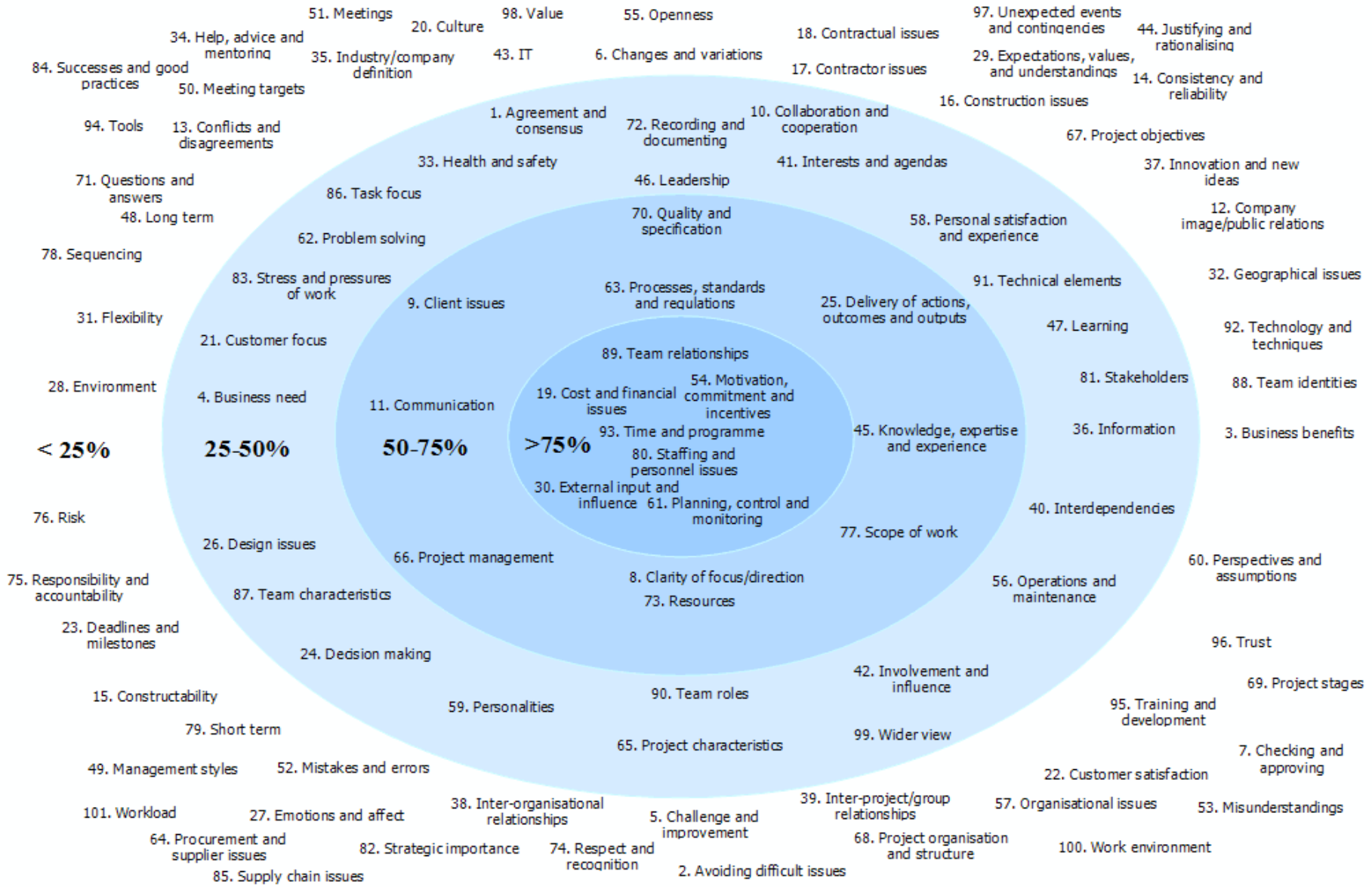


Figure 2: Percentage Occurrence of Themes Across Team Member Cognitive Map