

# KNOWLEDGE MANAGEMENT IN CONTRACTORS – DEVELOPING COMMUNITIES OF PRACTICE TO SUPPORT THE REUSE OF KNOWLEDGE

Christian Koch<sup>1</sup> and Christian Thuesen<sup>2</sup>

*Construction Management, Department for Civil Engineering, Building 115, Technical University of Denmark, 2800 Lyngby, Denmark*

The management of knowledge is currently assigned utmost importance in future competitive strategies for the construction sector. At least in Denmark handling of the knowledge component is seen as central in interpretation of the sectors future. This is even seen as a national task also encompassing knowledge producing institutions like the technical universities. The focus in this paper will however be on how knowledge management and knowledge production function in everyday processes of a contracting firm. Knowledge Management is a contested and emergent term. Both in academia and amongst consultants and practitioners multiple definitions flourish. The definition used here draws on learning organisation approaches, there distinguish between the learning and the management of learning. In this case the distinction is between knowledge processes and knowledge management. Knowledge Management is therefore defined as management activities that frame and guide knowledge processes in an organisation. The paper draws on a socio political and cultural understanding. Especially the concept of community of practice (c-o-p) is mobilised here (Wenger 1998). It is argued that multiple communities of practices might be in play in contractors engineering processes. The context is seen as an complex interplay between multiple communities. Case material from an ongoing study of the knowledge processes in a contractor shows how knowledge resides and exists in a number of forms in such companies. The knowledge production travels through several organisational cultures and takes the form of political processes of negotiating knowledge claims. Knowledge management strategies often encompasses a strong IT-component, but the c-o-p approach sees aspects like organisation, culture, training and office design as more viable. The approach is that joining information technology with the human resource oriented tools is but a necessary precondition for success in KM-efforts. Moreover the relative overemphasis on “circumstantial” frames for knowledge production and too little focus on dynamics in knowledge producing processes has to be corrected. In contrast soft tools used directly in the processes of the customer oriented projects is probably going to be central for the contractor.

Keywords: community of practice, contractors, knowledge management, soft tools

## INTRODUCTION

The North European construction industry features a division of labour and set of institutions, which has generated distinct bodies with different focus on different types of knowledge. The traditional split between planners and executors implies that the consulting engineers (and architects) have a focus on knowledges (in plural) related to designing the build environments, the contractors organise knowledges

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<sup>1</sup> ck@byg.dtu.dk

<sup>2</sup> ct@byg.dtu.dk

related to producing the built environment and the component and material suppliers organise knowledge related to their component and how it can be integrated in design and or production. The wider landscape include further types of knowledges and players. Today the handling of knowledge has indeed become the task of entire industrial systems, and so also the construction industry.

This paper discusses the handling of knowledge in a “crossover” type of construction company, a large design build contractor, which take responsibility for design as well as production. In this way this contractor breaks the picture of consulting engineers as the only knowledge intensive players in the new knowledge economy of construction. At the same time the challenge of organising knowledge is persistent, but changed in the direction of an inhouse problematic.

The contractor has through a series of quality management efforts come to the perception, that knowledge management is predominantly about reusing and positioning the existing knowledge at the right time at the right place. The focus in the present article is following this and thus less interested in innovation. Moreover we focus on the design process here.

The paper opens with a method presentation followed by an discussion on approaches to knowledge management, pointing at cultural and socio political approaches as the most interesting. Communities of practice is introduced as a means to understand the multiple engineering design cultures, which is in play in the design process.

## **METHOD**

The approach is multidisciplinary tying together engineering, interpretive sociology, organisation theories and management. In particular we are drawing on analytical strategies from anthropological (Wenger 1998) and organisational culture perspectives (Alvesson 1993, 2001, Martin , Martin & Meyerson 1987). It is suggested to adopt the scheme of differentiation, integration and ambiguity to reach a mapping of a multiple configuration of communities of practice, which is in play in contractor engineering design.

The present paper is preliminary and exploratory. The case material stems from an ongoing study framed in a ph.d.-study financed by the contractor. One of the authors (Thuesen) is since first of february on a daily basis present in the headquarters of the contractor and follows in the spring 2002, two ongoing building projects. One of them is the basis of empirical material presented below, covering one major two-day meeting. Apart from participant observation, also the documents developed by the actors as preparation for the meeting was available to us. Finally one of the authors drove with the responsible for the meeting both ways by car to the venue which gave further informal information. We recognize that this is somewhat insufficient with the claims of looking at a cultural unit such as a community of practice. The analysis is therefore clearly mainly instrumental for creating and developing a further research agenda. We also recognize that the research arrangement might create a pro-company bias, but attempt to mobilise a critical distance to outbalance the pregiven empathy with the company.

A potential occupational bias from the authors towards the players in constructions is recognised, but not analysed in detail (see Loosemore and Tan 2000a). It can be noted that both authors share the professional background as engineers with a multidisciplinary education and training in management and organisation.

## **A DEFINITION OF KNOWLEDGE MANAGEMENT**

Knowledge Management is a still contested and emergent term, both in academia and amongst consultants multiple definitions on knowledge, knowledge production and management flourish ( see Pritchard *et al.* 2000, Sverlinger 2001, Liebowitch 1999, Scarborough 1999). The definition used here draws on learning organisation approaches, there distinguish between the learning and the management of learning. In this case the distinction is between knowledge production and knowledge management. Knowledge Management is therefore defined as:

Management activities that frame and guide knowledge production in an organisation.

A set of activities and tools can be used as part of knowledge management. Koch (fo) discuss strategic management including intellectual capital accounting, Information Technology , organisation, office design and culture. Knowledge production in itself can be understood as a combination of retrieval, combination , creation and erasing of knowledge. In this context the reuse of existing knowledge is assigned attention, which means a main focus on retrieval and combination. How this can be done, has to be investigated through an understanding of knowledge as contextual and culturally embedded.

## **PERSPECTIVES ON KNOWLEDGE AND KNOWLEDGE MANAGEMENT**

Although the interest in handling and developing knowledge in organisations could be understood as a long term interest related to maintaining competitiveness, the recent interest in Knowledge Management as a management recipe has put a lot more emphasis on the perspective. Texts, articles and books as well as events on the issue are skyrocketing (see Scarbrough, Swan &Robertson 1999, 2000, 2001, Raub & RÜling 2001 for discussion on this fad phenomenon). And any contemporary consultancy firm one can think of, offers a full package of knowledge management strategies, knowledge management is thus something a company can buy (see Pritchard for a discussion of this commodification tendency, Pritchard 2001).Moreover different professionalisms and perspectives each strive at getting their cake of the prosperity linked to promoting the concern for knowledge on knowledge and knowledge management (Swan & Scarborough 2001). On this background it is tempting to ask, what a contractor might benefit in practice of exercising all this hot air? There is certainly a strong need to appropriate KM to a specific context and not getting carried away by chasing the latest fad. The first step in this process is to develop an understanding of the underlying mindset behind the various strategies suggested.

There is indeed certain positions which threats to dominate the discourse and set standards for the central concepts of knowledge and management of knowledge. Nonaka, Davenport and von Krogh are some of the central figures. Rather than developing a full-blown critique of these positions, this contribution will limit itself to give a few positional comments before focusing on cultural and socio-political approaches, which is cautiously believed to give most trade off in terms of guiding production of knowledge and management of the related processes in a dynamic consulting engineering setting. The mainstream knowledge management positions are a position under development. Nevertheless there is still a strong tendency to view the firm as a blackbox, and a somewhat static view on organisations. Moreover these position picture knowledge as either a well defined tangible entity or describe how it

can quickly become one, converting tacit to explicit (Nonaka *et al.* 2000) or of information to knowledge (Cohendet & Steinmuller 2000, Davenport & Prusak 1998). The analytical distinctions between categories of knowledge that follow along seem to be less operationable in practice (Nonaka *et al.* 2000, Cohendet & Steinmuller 2000, see Robertson 2001 *et al.* for a critique).

## **CULTURAL AND SOCIO-POLITICAL APPROACHES**

A growing body of literature take a cultural approach to learning and knowledge (Lawe & Wenger 1991, Bucciarelli 1995, Orr 1996, Downey 1998, Wenger 1998, 2000). According to this position, knowledge is embedded in a culture consisting of shared systems of meaning, rituals, verbal and psycial symbols (Alvesson 1995). The notion of “community of practice” is used to describe that collective learning results in practices that reflect both the pursuit of the framing enterprises and the attendant social practices. These practices are thus the property of a kind of community created over time by the sustained pursuit of shared enterprise (Wenger 1998:45). Knowledge is related to and attached to a set of practices, and is actually potentially meaningless if disentangled from these practices. Knowledge develops through mutual engagement, joint enterprise and a shared repertoire. The understanding it thus picturing knowledge as a heterogenous assemblage of tangible and non tangible elements and as something strongly contextual.

Studies of professional cultures, engineering cultures point at the importance of *object worlds*, somewhat ordered abstractions that represent the technologies which the engineers work with (Bucciarelli 1994). Designing engineers interaction is marked by numourous and variated tools, verbalisation and other other means. Orr (1996) thus highlights the importance of *storytelling*.

The boundary of the organisation is in the cultural view a less obvious limit to the knowledge creating processes (at least in contrast to the economics oriented positions mentioned above, Nonaka *et al.* 2000). Engineering cultures can be assumed to cross organisational boundaries and encompass informal networks enabling the maintaining and development of a professional object world, culture and formal status (Bloor & Dawson.1994).

Although community of practice approaches dismantle overly rationalistic perceptions of knowledge, they still suffer from a belief of the stability (see below) and non political features of the knowledge production. Political approaches would suggest to view the knowledge production as relying on temporary network building (coalitions), exercise of power, and related to exploiting rooms for manoeuvre along with opportunities, problem setting, boundary building and solution formulation. It implies continual reconfiguring of some elements of knowledge (in located accountabilities as Suchman (2001) put it) in coexistence with longer term and more stable basic knowledge elements (Lazega 1996, Contu & Willmott 2000).

## **THE COMMUNITY OF PRACTICE CONCEPT**

The community of practive concept has been created and developed by Lave & Wenger, Wenger 1998,2001 Brown & Duguid 1991, 2000 and numerous commentators/adopters. Wenger 1998 is used below to describe the concept. Wenger argue that collective learning results in practices and vice versa. This reflect both the pursuit of an enterprise and the attendant social practices. These practices are thus the

property of a kind of community created over time by the sustained pursuit of shared enterprise. Wenger points at three main elements in a community of practice (c-o-p):

- mutual engagement
- joint enterprise
- shared repertoire

### **Mutual engagement**

Wenger describes practice as a source of coherence. Practice exists because people are engaged in actions whose meanings they negotiate with one another. The group thus sustain dense relationship of mutual engagement. Such a mutuality does not mean that c-o-p is only characterised by harmony and consensus. Wenger actually argue that mutual relationships are complex mixtures of power and dependency, pleasure and pain, expertise and helplessness, success and failure (Wenger 1998 :77). A c-o-p is also characterised by diversity and partiality, some are more strongly included than others etc.

### **Joint enterprise**

The second feature is negotiation of a joint enterprise. This Wenger describes as not just a stated goal (p.78) but a collective process of negotiations, where the joint enterprise gets defined by participants in the process of pursuing it. The joint enterprise also embodies the members position in a broader system and is the members response to their conditions. It can be noted that both mutual engagement and joint enterprise has overlap with shared meaning which is a central concept in symbolic organisational culture understanding (Alvesson 1995).

### **Shared repertoire**

Finally Wenger describes how a c-o-p share a repertoire. The repertoire includes routines, words, tools, ways of doing things, stories, gestures, symbols, genres, actions or concepts. This should not be understood to mechanistic. The repertoire is inherently ambiguous and a shared practice does not in itself imply harmony or collaboration (s85). Nevertheless the repertoire is maybe one of the strongest direct manifestations of a community of practice and it also here shares elements with the organisational culture (Alvesson 1995)

## **MULTIPLE COMMUNITIES OF PRACTICE**

Moving beyond the single c-o-p Wenger (as well as Brown 2002) develops a discussion on relations and connections between different communities of practices (c-o-p-s). Two types of connections are discussed; participation and reification. Participation covers brokers, boundary spanners between two or more distinct c-o-p-s. Reification covers boundary objects, drawing on STS approaches (Fujimora, Leigh Star). Moreover overlaps between c-o-p-s is discussed.

Wenger demonstrates how two c-o-p-s can mutually strengthen each other in everyday practices (Wenger 1998 p) but downplays on the one hand the possibility of such a deep embedding of the overlap that ambiguity and tension are introduced and on the other hand disregards the possibility of two c-o-p-s that might be in conflict with each other, or even constitute themselves on a stereotypic image of “the others”(a phenomenon well described in organisational culture literature, Alvesson 1993).

Another important issue is the relationship between organisational boundaries and boundaries between c-o-p-s. Professional groups for example is a classical example of a bonded set of people, which broadly uses the same repertoire of tools, share a mindset and to some extent also a joint enterprise and engagement. However the relationship between members in a professional group seems to be somewhat looser than the relationships in a professional group all working in the same department.

Finally there is the issue of a managerially installed c-o-p. On a corporate level there might be a strong wish to develop an unitary organisational culture or c-o-p. This can be enforced by a set of means of economic, technical and social character. It will often be characterised by an emphasis on the joint enterprise and engagement of the company as such.

## **THE MULTIPLE CONFIGURATION OF COMMUNITIES OF PRACTICES**

Wenger description of the multiple communities ends up being increasing complex. He thus describes the multiple communities like this

“by weaving boundaries and peripheries, a landscape of practice forms a complex texture of distinction and association and impossibilities, opening and closing, limits and latitude, gates and entries, participation and non participation.” (Wenger 1998 : p 121)

It is striking that when one combines this with subsequent attempts to apply the concepts to various contexts, then some of the attempted complexity has been left behind to the benefit of relatively simple differentiation. (Kauhaluoma 2000 and Hislop *et al.* 2000 is just two examples). Scholars have attempted to distinguish c-o-p-s from each other forgetting the potential complex texture over overlapping and ambiguous relationship to several c-o-p-s. It is on this background that we propose to adopt an analytical strategy from organisational culture studies. Since Martin & Meyerson 1987 a strand of studies propose to tackle the research issue, one, several, distinct overlapping culture(s) by looking for elements of differentiation, integration and ambiguity to reach a mapping of a multiple configuration of communities of practice (Alvesson 1995). Applied to communities of practice this implies that it is an empirical question how the multiple configuration of c-o-p looks in a particular setting. One will have to look for how strong and with which scope the mutual engagement and joint enterprise reaches, when it will be necessary to distinguish between different set of repertoires etc. Hislop *et al.* (2000) for example discuss seven cases, which is characterised by differentiated communities of practice, on the basis on structure, geography, business units, products and occupation. Hislop *et al.* argue that the strong differentiation is due to limited cooperation between units or other.

## **MULTIPLE CONFIGURATION IN CONSTRUCTION ENGINEERING**

Before engaging in the case we will here sketch how a multiple configuration of c-o-p-s might look like in construction engineering. It is characteristic that a contractor like the present operate in a knowledge and actor landscape that align different types of potential communities of practice. Consider as examples the architects, the steel-specialists and the bricklayer-company. Each of those represent predominantly external c-o-p-s to which the contractors internal c-o-ps relate, typically through a

project. The internal c-o-p-s are building physics engineering staff, heating and water supply engineering, construction management and more. Usually these c-o-p-s are organised in departments, which shares space in the company-s headquarter. The projects on the other hands could be viewed as temporary c-o-p-s, or if they are too weak for that, just arenas for brokering, boundary objects and other interaction (see for example Huang *et al.* 2002). We would argue that the project organisation is a recurrent frame for cooperation where certain actors, time and again share a repertoire of tools (i.e. project management etc.) and that the group also share mutual engagement and commitment. Drawing on Loosemore and Tan (2000b) one can even argue that cooperation in projects incorporate a well rehearsed set of rituals and narratives reifying occupational stereotypes. In other words, a new project might employ new partners but the c-o-p- embedded in projects help actors to relate and develop the community needed to progress the project. So far we maintain it as an empirical question on what condition as project can be viewed as a community of practice

## CASE

The building project followed is in process of realising a new Danish headquarter for a large multinational service enterprise. The meeting was a two day session designed to review the finished project material before beginning the actual building. It was formally an quality audit.

Participant was seven representatives of the contractor, five of the consulting engineer and two from the architect. The meeting was held at a hotel and participants expected to stay the night.

The meeting was structured in themes:

- Building physics
- Water and heating
- Roof and inner facades
- Installations
- Staircases
- One particular floor in the building

In between these formal elements the agenda also encompasses coffee breaks, dinner , a stroll by the beach etc.

The formal part of the meeting develops as a long row of dialogues on small and large issues of the building. Under staircases for examples is discussed the fitting between walls and steps, a wooden loft in the canteen, air draft when doors are open. The last is considered a major problem because of the link between large rooms, open doors and the staircase. The problem has to be discussed with the owner.

In each case there is a negotiation on whether the design and the assumptions behind are satisfying. It is sometimes a latent negotiation, other times and open negotiation, where a compromise is found, it is sometimes a controversy which is solved, sometimes not really but suppressed. The lines of debates go across the three participating companies and internal in the companies although the architect has a special status

The project had at this time run for more than one year. When recapitulating the design consideration a joint practice and understanding is revealed, in a sense this can

be said to constitute the project community of practice but on top of this other groupings occur over time. When discussion pillars under building physics for example it is two from the consulting engineer, one from the contractor and there is made references to people working at another consulting engineer. Here are the contours of a professionally bonded c-o-p around building physics. Finally the different specialisms are articulated; electricity, water and heating, concrete assembly.... Each can be said to constitute a c-o-p.

There thus seems to be the contour of a configuration of multiple configurations of practice. By applying first the integration perspective we got to focus on the project as a common c-o-p across companies and specialisms. By focusing on specialisms, professions and companies in the differentiation perspective we find several other c-o-p. Some are clearly overlapping, whereas other are more directly distinct. In the written documents which is preparations for project auditing one finds a shared repertoire of ways to describe issues to be discussed, although the forms are different and some are printed others handmade. And the minutes probably also represent a tool in a repertoire for project management.

## CONCLUSION

In this version the analysis of a multiple configuration of communities of practice are clearly preliminary. We cannot underpin our assumptions by more than one occasion and there need to be more to underpin a proper culture and c-o-p analysis. The impression is however that the approach is promising. The coexistence of several communities which not are clearly separated, but is mutually overlapping seem to account for some of the either overly harmonic or too “separative” connotations the first generation communities of practice analysis had. The ambiguity related to the belonging to several communities can explain some of the controversies emerging, we must however also note that adding a socio-political dimension to the community notion seems to pay strongly off, since negotiations are prevalent in the process.

The managerial implications are that joining information technology with the human resource oriented tools is but a necessary precondition for success in KM-efforts. Moreover the relative overemphasis on “circumstantial” frames for knowledge production and too little focus on dynamics in knowledge producing processes has to be corrected. In contrast soft tools used directly in the processes of the customer oriented projects is probably going to be central for the contractor.

In these processes boundary objects, brokers and other means that actively link communities of practice in new ways are extremely important for assuring the reuse of knowledge.

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