MANAGING KNOWLEDGE IN CONSTRUCTION PROJECTS: EXAMINING THE CONTRIBUTION OF COMMUNITIES OF PRACTICE.

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ABSTRACT

Drawing primarily from the literature in the fields of project management and knowledge management the authors seek to critique the contribution that Communities of Practice (CoP) could make to enhancing the process of knowledge transfer in a construction setting. While, at face value, the CoP model offers several possibilities for more effective transfer of learning within and between project environments, applications of the CoP as a learning strategy may be subject to a range of constraints, depending upon the type and complexity of the project. Issues of trust and security, especially in contractually bound or politically sensitive project environments, the diverse nature and inherent instability of project teams, special needs of SMEs and distributed teams, all challenge accepted models of CoP. Bounded CoP, with restricted membership, confined along organizational or discipline lines, might provide part of the answer, but the rules of engagement would need to be carefully defined for optimal exchange of information and learning to take place. However the bounded CoP is less likely to produce the richer forms of learning that can occur when access is entirely free. Transfer of learning from one project context to another remains a challenge for organizations and for the industry as a whole.

INTRODUCTION

A persistent barrier to the development of project management as a discipline has been in the management of project knowledge ie in the capture, storage, sharing and subsequent use of the experiences that project team members undergo during a project. One level of enquiry is focused on the knowledge acquired and generated by the project team. Another level, and generally recognized as more problematic is the transfer of knowledge to other project contexts once project teams have disbanded. Current

thinking about knowledge management (KM) extends beyond data capture and IT solutions, which abound in traditional project industries, such as construction and engineering, (McConalogue, 1999; Robinson et al, 2001; Kamara et al, 2002, Leseure and Brookes, 2004; Carillo, 2004; Love et al, 2004, Love et al, 2005). The concept of Community of Practice (CoP) defined initially by Lave and Wenger (1991) and later developed by Wenger (1998) and others (Skyrme, 1999; Barab and Duffy, 2000; Gherardi and Nicolini, 2002; Lehaney et al, 2004) has only recently received attention in the project management professional literature (Galarneau and Rose, 2002; Morris, 2002). The CoP is being proposed as one potential solution to the problem of project knowledge transfer within and between project teams.

Drawing primarily from the literature in the fields of project management and knowledge management the authors seek to critique the contribution that CoP could make to enhancing the process of knowledge transfer in a construction setting. The benefits and challenges that CoP might bring to such a setting are discussed.

CONSTRUCTION PROJECTS AND THE COMMUNITY OF PRACTICE CONCEPT

On initial analysis the project environment would appear to comply with all three of Wenger's three dimensions of a CoP (1998:72-85). There exists a level of *mutual engagement* in practice between parties who are involved in projects. A project is certainly a *joint enterprise* between a number of individuals who might come from a variety of organistions and backgrounds to achieve agreed goals. At the wider level, within the project management professional community, there is a shared interest in improving practice. At least amongst construction project management professionals there is a *shared repertoire* of language, routines, stories and cultural artifacts. However the peculiar natures of the range of initiatives that are referred to under the generic name 'projects' suggest a number of structural and organizational barriers to free exchange and development of knowledge within the CoP model described by Wenger and others. Although the concept of the CoP is now being offered as a possible solution to some of the challenging knowledge transfer issues, there are a number of characteristics, peculiar to construction projects, which might influence effective application of the CoP concept. In the absence of much needed discipline specific research, the following

article interrogates the concept of the CoP and its application to construction project management.

PROJECT TYPES

Projects should not be treated equally. In contrast to the current fashion for describing any co-operative venture as a project, projects from traditional project disciplines, such as construction and engineering, tend to be conducted within highly formalized contractual conditions. In government and community sectors, more and more large-scale projects, are also subject to increasingly high levels of public scrutiny. Most research into the efficacy of the CoP model has been done with projects in communities for which the risk of litigation is very low, such as education (Hirst et al, 2004). If follows therefore that the terms of operation of a CoP for a multi-national, politically sensitive construction or engineering project, would need to be radically different from those governing projects which are not so constrained.

Research about KM has tended to focus on large organizations, however in the construction industry the vast majority of organizations employ less than 5 people (www.construction-innovation.info, 2004). Interviews conducted within the construction sector in the UK, (Cushman et al, 2002), revealed differences between organizations in their ability to create and use knowledge, large firms demonstrating commitment to R & D, small firms seeing themselves as consumers of knowledge. SMEs reported feeling isolated from knowledge networks and although they reported the need for knowledge networks, these networks had not been established. Recently government initiatives have endeavored to improve access to industry knowledge through cross-industry knowledge portals (see for example www.constructingexcellence.org.uk, 2004, funded by the UK Department of Trade and Industry). The most successful of these combine a range of knowledge creating and transferring activities, including seminars and lectures, specialist coaching and various forms of CoP. Access is available face to face, by telephone or online as needed. This recent extension and development of the CoP is particularly suited to knowledge transfer in the construction sector. However, as the following discussion suggests knowledge transfer using the CoP model might be inhibited by the peculiar characteristics of the construction industry.

TRUST AND SECURITY OF INFORMATION

Trust (or rather lack of trust) has been recognized as a potential barrier to effective project delivery in the construction industry (Zaghloul and Hartman, 2003; 2002). Project management contracts that force transfer risk also inhibit free exchange of knowledge and there exists an adversarial rather than a problem solving relationship between stakeholders. Additionally, networking that involves information transfer may result in critical breaches of confidentiality (Bouty, 2000). In these circumstances project team members would be unable to participate in fully honest discussions in a CoP, particularly before the project has been completed and handed over. Ongoing litigation can even prevent free exchange of information until many years after project completion. Examples exist of alliances and partnerships which have successfully bridged the trust issue, parties working collaboratively to deliver the project (Cushman et al., 2002; Pitsis et al., 2003) but these are rare in an industry which is highly risk averse and contract driven.

Another consequence of lack of trust is reluctance to talk about project failures. Successes are communicated reasonably effectively as 'war stories' but failures are under reported except where public investigations demand. As research in progress is demonstrating, the 'conspiracy of silence' becomes compounded within the higher echelons of project governance (Helm and Remington, 2005). Kelleher and Levene (2001) found that KM was significantly affected by reluctance to admit ignorance with employees believing that they are paid to solve problems. Consequent feelings of vulnerability meant that they were unlikely to seek advice. Successful implementation of a CoP is linked with both corporate and project culture and prevailing attitudes to sharing of lessons learned.

THE PROJECT TEAM AS A SPECIAL CASE OF COP

Projects are by nature ephemeral activities. Project teams exist for relatively short periods of time. The project team is a structured unit, brought together for a specific purpose which differentiates it in aspects of power and hierarchy from most models of CoP. At the simplest level the project team comprises a group of individuals who contribute different expertise and knowledge to the project. Often the project team extends well beyond those concerned with execution of the immediate planning and management of the project and reaches out to include members of stakeholder groups,

including contractors, sponsors, end users, community representatives and others who have varying levels of interest in the outcomes of the project. Thus the project can comprise a loose series of groups rather than exhibiting characteristics commonly associated with tightly constructed teams. Involvement of stakeholders in cross-functional projects demands the nurturing of project awareness, in particular through building common knowledge and promoting the benefit. The CoP concept would appear to support dissemination of the rich information and knowledge needed to sustain such a large and diverse project team.

In this respect the extended project team might be seen as a special case of CoP with a lifespan limited to the duration of the project. Although Huang and Newell (2003) concluded that "only limited strong ties can be developed purely by the project team members", they also note that through a process of referral (Burt, 1992) the strong ties were extended, allowing teams to expand their social networks to a broader network. Such boundary spanning (Ancona & Caldwell,1992) into knowledge networks is critical, as small project teams often cannot include all the expertise needed for a particular project. Similarly, individuals with a certain technical expertise may often need to serve various projects simultaneously, thus prohibiting organizations from assigning them full-time to a single project. Furthermore, research into the groupthink phenomenon has shown that integrating external knowledge and experience is an important component of effective decision making, particularly in teams with complex and innovative tasks (Hoegl et al, 2003; Neck & Moorhead, 1995).

TEAM STABILITY

Even though there is a plethora of studies on team member change and stability, research on member stability in cross-functional project teams is still lacking. Team stability has a positive effect on outcome variables including team learning (Akgun and Lyn, 2002). Particularly in projects of long duration, the frequency of turnover of project team members can be a challenge to KM. On the other hand, there is also mounting evidence that team member stability may actually be disadvantageous for creation of new knowledge under some circumstances, such as high levels of market and technical turbulence (Akgun and Lyn, 2002; Clutterbuck, 2003). Formation of a CoP for the project might in some ways bridge the gap between learning loss through member instability and the need for knowledge creation.

KNOWLEDGE TRANSFER ACROSS PROJECT PHASES

It is common practice to change the project team at each phase of a project for the simple reason that different types of expertise is needed at different phases of the project. For instance, in a building project, design development, feasibility studies and detailed documentation might be performed by the architectural team, whereas implementation of the project would be the responsibility of the construction team and management of the final building by a property management team. Effective and efficient communication of knowledge about the project at each of these phase changes is fundamental to the successful delivery of the project. While procedures exist within traditional project environments, such as engineering and construction, often they have not been developed in non-traditional project environments, such as business or community infrastructure projects. A CoP might assist in sharing peripheral knowledge that is normally excluded from official minutes and other records, however, the litigious nature of many project environments would limit the amount of 'rich' information, and therefore knowledge, that could be exchanged online.

BARRIER TO RECOGNITION OF A NEED FOR LEARNING

A CoP by definition is voluntary association of individuals who wish to share knowledge and experiences. Without a perceived need for learning it is unlikely that participants will freely engage in learning activities. Teams in the construction industry generally comprise people who like solving technical problems. Therefore if learning takes place preference will be for technical issues and the 'harder', formal side of management, such as contract law. Learning about the 'softer' people-oriented side of management is likely to be a low priority. If the project is simple and relatively unchallenging little perceived need for sharing learning is likely. Lack of perceived need for learning can be an important barrier to engagement with a CoP. As projects increase in scale and public accountability increases, teams are likely to be more diverse and the complexities of dealing with multiple stakeholders, in addition to technical challenges, provides opportunities for sharing both explicit and tacit forms of knowledge, as defined by Nonaka and Takeuchi (1995). In this situation the propensity for recognizing the need for learning 'softer', people-centred forms of knowledge has the potential to increase.

Available time can be another barrier to perceived need for learning. Development and maintenance of networks is time consuming and may divert attention from apparently more productive activities (Ancona and Caldwell, 1992). Usually a project is driven by milestones defined early in the planning phase: therefore the nature of the learning tends to be restricted to what is perceived as essential for the delivery of each particular project. Research suggests that the time constraints experienced by project team members significantly influences the kind of learning that takes place during a project. Although attendance at CoP meetings or involvement with a community online is not seen as a direct cost to the project, project personnel often work under conditions of considerable pressure; 12 hour days, 5.5 days per week being the norm. The results of a study by Kelleher and Levene (2001) highlighted time as the most frequently cited barrier to KM. The strong emphasis on prioritization of tasks means that KM activity such as attending CoP meetings is seen as desirable but not essential.

DISTRIBUTED TEAMS AS COP

Project teams may or may not be co-located. In large construction and engineering projects it is now common practice to have a centrally located 'project room' as a meeting room and repository for all documents, greatly assisting with version control, especially when projects are fast-tracked. However with multi-national projects and ever-increasing globalisation of design and construction, teams are having to work across time and space, assisted by computer mediated communications. As designers often work in isolation from team members some researchers are suggesting that less formal social practices found in CoP facilitate the sharing of experience and knowledge more effectively than conventional teams (Pemberton-Billing et al, 2003). For online CoP trust has been shown to be an issue even within communities that are not usually constrained by fear of litigation (Kling and Courtright, 2003).

PROJECT TO PROJECT KNOWLEDGE TRANSFER

'Reinventing the wheel' is symptomatic of many project environments. An important potential application of the CoP is being trialled within some large organizations to assist in transfer of learning between projects and teams. The characteristic of uniqueness, which is often used to distinguish functional processes from projects, frequently results in lack of transfer of knowledge from one project to another or from one team to another working on concurrent projects. Once the project team is disbanded

members tend to move to other locations within the organization or even outside the organization, taking project knowledge with them. Thus there is no guarantee that knowledge thus gained will be transferred effectively to other project situations. This phenomenon is poorly researched but widely recognized as highly problematic (Galarneau and Rose, 2002). Variations of CoP currently being explored include discipline specific interest groups, project executive groups and in some organizations and professional groups for women in construction. Most of these CoP tend to be located within individual organizations. However there are also examples of informal cross-organisational groups which have been established by practitioners dissatisfied with the quality of knowledge exchange within professional bodies. These groups should be distinguished from professional benchmarking organizations, which charge membership fees. They exhibit many of the characteristics of a CoP. Participation is voluntary, organization is fluid, trust is high and there are no membership fees. However, like exclusive clubs, they are distinguished by the fact that membership is tends to be by invitation and restricted to senior executives.

Until very recently the focus on managing project knowledge has been on technology. Most medium to large construction and engineering organizations are relatively data rich. High-level access is available to current industry data through a range of groupware applications, usually delivered via intranets or extranets. In addition, the construction and engineering industries have comprehensive, commercially developed and managed databases covering facts such as current prices and trends. Many software applications also offer facilities for linking current data-bases with a range of project management tools; critical path networks, budgets, issues registers and forecasting and analysis tools, such as earned value management. Nevertheless the focus on technological solutions has overshadowed the 'softer' aspects of project KM, particularly at the personal and team level. Management knowledge, as opposed to technical knowledge, is typically more tacit than explicit. It is highly contextual, complex and tends to be learnt most effectively 'on the job', in personalized and action learning situations. Bearing in mind some of the constraints noted above, potentially the most useful application of the CoP model is for project to project transfer of the kind of knowledge that is 'not on the record'.

CONCLUSION:

While, at face value, the CoP model offers several possibilities for more effective transfer of learning within and between project environments, applications of the CoP as a learning strategy may be subject to a range of constraints, depending upon the type and complexity of the project. Issues of trust and security, especially in contractually bound or politically sensitive project environments, the diverse nature and inherent instability of project teams, special needs of SMEs and distributed teams, all challenge accepted models of CoP. Bounded CoP, with restricted membership, confined along organizational or discipline lines, might provide part of the answer, but the rules of engagement would need to be carefully defined for optimal exchange of information and learning to take place. However the bounded CoP is less likely to produce the richer forms of learning that can occur when access is entirely free. Transfer of learning from one project context to another remains a challenge for organizations and for the industry as a whole. Further research is needed to explore how learning through the 'spillovers or overflows' (Callon,1998) might be more effective for KM than planned knowledge transfer events, particularly within for the complex environments in which construction projects are managed today.

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The result, we think, is a set of stimulating, thought provoking and significant papers that we hope you will enjoy for their contribution to our discipline.

Göran Runeson and Rick Best
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