# "Identifying the Critical Factors that Determine the Success of Communities of Practice within an Engineering Design Consultancy"

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## ABSTRACT

Knowledge management has received considerable interest within the construction industry in recent years. In particular, organisations and academics have highlighted the potential benefits to be gained from successfully implementing people-orientated knowledge management solutions, of which Communities of Practice have become a recognised, and in many cases, a successful and preferred technique.

The aim of this research is to identify the critical success factors for technical Communities of Practice within an engineering design consultancy. To achieve this, a series of interviews were carried out with key members of staff involved in Communities of Practice within a leading engineering design consultancy. This provided the research with both strategic and operational perspectives. The interview findings were then compared with the key recommendations outlined in related Knowledge Management literature. The sponsoring company has carried the research forward and is looking to implement the critical success factors identified through this study to further enhance the effectiveness of its Communities of Practice.

Based on the findings from the interviews and the Knowledge Management literature reviewed, the research proposes a series of methods necessary for ensuring that an organisation can maximise the potential of its Communities of Practice. The results suggest that the effective use of Communities of Practice can support the business on both a strategic and project level.

## KEY WORDS

Knowledge Management, Communities of Practice, engineering consultancy, Task Groups.

## INTRODUCTION

Knowledge is increasingly being recognised by commercial organisations as a source of competitive advantage (Edvinsson 2000, Johannessen and Olsen 2003). In recent years Knowledge Management (KM) has received a large degree of interest from many academics and practitioners, who have proposed numerous KM approaches and solutions.

Although two different approaches to KM; people-orientated and technology-orientated, have been used in the past, there is now a general consensus amongst academics and practitioners that a holistic approach is needed with both people and technology-based aspects considered together. Many authors are of the opinion that the people-focussed aspects of KM are of primary importance, although to be effective and sustainable these will require the support of technology-based solutions (Carrillo 2004, Pan and Scarbrough 1998).

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Communities of Practice (CoPs) represent a primarily people-based KM solution which has received widespread coverage in KM literature.

This paper examines the factors, which determine the effectiveness of CoPs within a 600-strong multi-disciplinary engineering design consultancy. The research includes a review of KM literature and a number of qualitative interviews with members of staff responsible for CoPs within the case study organisation. The analysis of the data collected has resulted in the formulation of a number of conclusions, taking a high-level view of the necessary conditions and requirements for CoPs to successfully support an engineering design consultancy.

## KNOWLEDGE MANAGEMENT IN CONSTRUCTION

The recent interest in KM within the construction industry has resulted in a large amount of literature on the subject. The following review enables an understanding of similarities and differences in the statements made by previous KM authors.

Many UK construction organisations have acknowledged the potential of the knowledge held by their staff and the need to manage it (Carrillo and Chinowsky 2006, Robinson et el. 2001). However, managing this knowledge is a complex issue, the solutions for which must be tailored to fit each individual organisation (Al-Ghassani et al. 2004). Davenport and Prusak (1998) describe KM as a process of capturing, distributing and effectively utilising knowledge, while Robinson et al. (2005) define KM as a method of exploiting, or transforming knowledge as an asset for organisational use to facilitate continuous improvement.

The necessity for organisations to consider the use of various KM approaches can be explained by the existence of different types of knowledge. Nonaka and Takeuchi (1995) describe two kinds of knowledge. The first is explicit knowledge, which can be articulated through formal language and can be transmitted across individuals formally and easily. The second is tacit knowledge, which exists as personal knowledge embedded in an individual's experiences. This type is hard to formalise, and difficult to communicate or share with others.

Despite the complexities involved with the transfer of tacit knowledge, KM techniques such as CoPs provide a viable solution (Verburg and Andriessen 2006). Indeed, following a survey of large construction organisations, Carrillo et al. (2002) stated that CoPs were the most widely used KM technique. KM authors also suggest that large international construction companies have the greatest need for, and benefit most from CoPs (Egbu and Robinson 2005). Verburg and Andriesson (2006) also state that CoPs have found particular interest due to the failure of computerised systems to support KM.

## COMMUNITIES OF PRACTICE (CoPs)

Wenger et al. (2002) define CoPs as:

> *"Groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis."*

Similar definitions are proposed by Davenport and Prusak (1998) and Lesser and Fontaine (2004), who describe CoPs as self-organising groups that establish a regular system of interchange, which are initiated by employees who communicate with one another because they share common work practices, interests or aims. Although 'Communities of Practice' has become a well-used term within the literature, they are also referred to as 'knowledge communities', 'knowledge networks', 'learning communities', 'communities of interest' and 'thematic groups' (Al-Ghassani et al. 2005).

The literature highlights the fact that there are numerous different forms of CoPs, which vary between different organisations and conditions. Although Wenger et al. (2002) state that CoP size, lifespan, distribution, formality and intent can all vary, they describe four types of communities commonly found in organisations as being:

- *Helping communities*, focused on solving everyday problems and sharing ideas;
- *Best-practice communities*, concerned with the development of best-practices;
- *Knowledge-stewarding communities*, concerned with distributing knowledge; and
- *Innovation communities*, fostering the development of unexpected ideas and innovations.

Saint-Onge and Wallace (2003) describe several generic CoP characteristics, which also serve to outline the basic requirements of a CoP:

- CoPs should be self-managed, providing solutions based on experience.
- CoPs should create knowledge that supports the organisation and establish their own norms and guidelines.
- CoPs should be a resource for their members, where each member supports the others.
- Organisations should recognise the importance of CoPs and collaboration.

## COMMUNITY MEMBERS

Saint-Onge and Wallace (2003) state that member commitment is vital for CoP success. They suggest that although CoP membership can be less permanent in the early stages, once the CoP establishes a strategic purpose the members will see a direct impact on their ability to perform, and are more likely to stay involved. The literature identifies CoP coordinators as being particularly important for CoP success, stating that they should identify important issues, plan and facilitate events, link members, manage CoP/organisational interfaces, help to build a knowledge base, and assess CoP progress (Wenger et al. 2002, Wenger 2000).

## BENEFITS OF COPS

The value added by CoPs is a topic, which continues to be debated (Saint-Onge and Wallace 2003). Wenger et al. (2002) suggest that it is important for the value of CoPs in stewarding knowledge to be fully understood, and that organisations should set the right expectations and acknowledge that CoPs are not the means to replace teams or business units. The literature commonly divides CoP benefits into organisational benefits, community benefits and individual benefits (Wenger et al. 2002, Saint-Onge and Wallace 2003, Fontaine and Millen 2004, Frost and Schoen 2004). These are described in Table 1. Indeed, these benefits could also serve as success metrics; a CoP could be assessed through its ability to deliver the three sets of benefits.

Table 1: CoP Benefits

| Individual Benefits | Community Benefits | Organisational Benefits |
|---|---|---|
| Establishes a network of contacts | Establishes trust between members | Increases opportunities for technology and innovation |
| Provides a sense of community and enhances job satisfaction | Improves collaboration and access to expertise | Enables faster problem-solving and quality of decision-making |
| Enhances reputation and a professional sense of identity | Enhances power sharing and influence within the business | Aids employee recruitment, development and retention |
| Expands skills, expertise and confidence in approaching problems | Develops a common language, methods and models around specific competencies | Enhances strategy, efficiency, cost savings, and authority with clients |
| Supports daily work activities and team contributions | Shares knowledge and retains expertise | Improves speed of service and quality assurance |

## MANAGING AND SUSTAINING COPS

CoP management techniques have become a key topic within the literature. De Laat and Broer (2004) suggest that many CoPs are formed naturally from networks, which are established spontaneously. Saint-Onge and Wallace (2003) support this viewpoint, stating that:

> *"Early analysis of knowledge-based organisations identified groups of employees getting together to solve work-related problems, without management directive or involvement."*

However, many authors suggest that management support for CoPs is a crucial element. Wenger et al. (2002) state that although management is necessary for CoP success, CoPs can be resistant to over supervision and as a result cannot be measured and managed in conventional ways. They suggest that although management methods may seem informal in the early stages, they will need to become more rigorous over time as investments increase.

The difficulties associated in determining the best-suited management methods for CoPs are well documented (Lesser and Fontaine 2004). KM authors have suggested that formal management approaches can be at odds with the informality of CoPs, and that the correct balance is needed to prevent the creation of discrete, isolated and inward-looking CoPs, which may inhibit organisation-wide knowledge sharing (Quintas 2005, Hislop 2004). Sheehan et al. (2005) suggest that organisations, which are formal and hierarchical can be detrimental to CoPs, as they may be perceived to be less business critical than project teams.

Middle and senior managers play an important role in fostering CoP success. They need to visibly value CoPs, provide resources, recognise the efforts made by CoP members, promote CoPs as 'industry best-practice', and ensure that CoP objectives are aligned with those of the business (Frost and Schoen 2005, Saint-Onge and Wallace 2003, Wenger et al. 2002).

## CRITICAL SUCCESS FACTORS

The importance for effective CoPs is illustrated by Gold et al. (2001), who explain that successful KM initiatives enable organisations to become more innovative, better coordinate their efforts, rapidly commercialise new products, anticipate surprises, become more responsive to market change and reduce the redundancy of the knowledge and information available to them. Several authors have examined the specific issues that contribute to CoP effectiveness and have proposed a number of critical success factors. Vestal and Lopez (2004) identify the following nine key factors necessary for CoP success:

1. A clear and compelling business case for all involved.
2. A dedicated and skilled facilitator or leader.
3. A comprehensive knowledge map outlining the required focus of the CoP.
4. An outlined and easy-to-follow knowledge sharing process.
5. A supporting technology to facilitate knowledge exchange, retrieval and collaboration.
6. Communication and training plans for members and others outside of the CoP.
7. An updated and dynamic roster of CoP members.
8. Metrics of success to show business results.
9. A recognition plan for CoP participants.

Lee and Neff (2004) examined the impact of supporting technology. They state that face-to-face contact is essential, and suggest that technology can, at best, support CoPs in-between such events. They also state that although technology is important, it cannot launch and/or sustain an effective CoP on its own.

Wenger et al. (2002) state that due to the voluntary nature of CoPs, their ability to attract and engage members by generating excitement, relevance, and value will determine their level of success. They continue by identifying seven critical success factors for CoPs:

1. Design CoPs for evolution and recognise that a CoP's focus is likely to change.
2. Include both inside and outside perspectives to determine the right direction for a CoP.

3. Establish a coordinator, core group of attendees, and a suitable level of participation.
4. Develop both public and private community spaces allowing for meetings and websites, as well as one-on-one networking of community members.
5. Regularly discuss CoP value. Although early value may be provided by tackling current problems, as the CoP 'grows' the development of knowledge becomes more important.
6. Combine familiarity and excitement.
7. Create a rhythm for the community by holding regular events at the right frequency.

Despite the CoP best-practice guidance outlined in the literature, authors are calling for further research and understanding of the conditions necessary for successful CoPs. While Verburg and Andriesson (2006) state that little is yet known about their useful way of working and what would constitute useful success conditions, Soekijad et al. (2004) state that despite the attention form organisations, academic interest in CoPs is still limited.

## CASE STUDY

The sponsoring organisation is a multi-disciplinary engineering design consultancy with thirteen offices based both in the UK and internationally. As well as structural engineering (its core business) it also offers a number of other disciplines including; building services, fire, façade, and geotechnical engineering, bridge design, infrastructure and public health, environmental assessment, and sustainable and renewable projects.

Task Groups (TGs) are the organisation's equivalent to a CoP, and are made up of groups of employees who volunteer to address issues for a particular area of the business. There are 33 TGs in total covering a wide range of subjects, which involve approximately 200 members of staff. TGs can address topics that are raised by the company's management meetings, by anyone within the organisation through a feedback system on the company intranet, or topics communicated to them informally. Following the resolution of an issue by the TG, its members then determine how to disseminate that information. The organisation is primarily interested in improving the 18 TGs that are focussed on technical aspects, which are therefore the focus of this research. TGs have always been fundamental to the organisation's culture and it has previously implemented improvements, based on extensive research examining how the organisation can enhance the way in which it supports TGs (Matsumoto 2006). The company wishes to build on its previous research, and continue to drive TG best-practice.

## METHODOLOGY

The aim of the research was to identify the critical success factors necessary for CoP effectiveness within an engineering design consultancy. To achieve this, a set of semi-structured interviews with the 18 technical TG chairs, and a focus group with three company directors who are responsible for KM issues were carried out. This provided the research with both operational and strategic TG perspectives. The interview and focus group findings were then compared with the key recommendations outlined in the literature. The purpose of a case study methodology was to facilitate access to staff who could explain the importance of CoPs to the organisation, and the factors that affect CoP success.

Based on the critical success factors identified by Wenger et al. (2002), Vestal and Lopez (2004), and Lee and Neff (2004), the TG chair interview topics were as follows:
- How TG objectives are determined and how the organisation provides support for TGs;
- How regularly face-to-face TG meetings/events are held, and who the TG members are;
- How the TG chairs feel their TGs support the business;
- How the TGs disseminate the knowledge generated within their meetings, and how they communicate this across the business;
- How technology is used to support the TGs; and
- How TG success is measured and recognised.

Each of the six areas was discussed in turn with the TG chairs, who presented their views and ideas. Each interview lasted approximately 45 minutes and was supplemented by information available on the company intranet, internal (TG) reports, and copies of presentations made by the TGs to various members of the organisation. During the focus group the directors were presented with the key TG topics identified by the TG chairs during the earlier interviews, and their views and reactions were recorded. The two sets of data enabled an understanding of the factors that the members of staff involved with CoPs considered as critical to their success.

## FINDINGS FROM THE TG CHAIR INTERVIEWS

The TG chairs stated that they determine their own objectives and deliverables. Although the majority were focussed on current project issues and tackling short-term objectives, which they felt was valuable to the business, they recognised the need for a constant alignment of longer-term objectives with the organisation's strategic direction. They acknowledged that in order to achieve this, they needed closer involvement with senior managers and an improved communication process. They stated that up-to-date objectives would ensure that TGs continue to integrate effectively with the expanding organisation, and do not become peripheral groups.

The regularity of TG meetings varied. While a few met on a monthly basis, several met once or twice a year. It was interesting to note that the TGs that met regularly were those that were directly linked to the organisation's strategic business plan, and as a result had chairs and senior managers who were more closely involved. The chairs were very enthusiastic about their TGs, but cited a high project workload as the reason for spending less time than they would like to on TGs. Because TG meetings were normally carried out over lunch breaks and were seen as informal events the chairs stated that it can be difficult to come away from their projects to work on TGs. Several suggested that allocating specific office hours to TG work rather than lunch breaks would encourage greater commitment from members, and that a greater allocation of TG budgets would enable them to commit more resources to TG work.

The chairs recognised the importance of commitment from TG members. Several stated that they required new volunteer members. While some stated they would simply benefit from more people to tackle the TG workload, irrespective of experience, other TGs required people with high levels of skill and experience to maintain the high levels of quality on TG projects.

Because many TGs were focussed on current project issues, some were only active for short periods of time when a related issue was raised on a project. The chairs were concerned that the periods of inactivity may result in a lack of long-term support for, and awareness of TGs. Wenger et al. (2002) provide guidance on this issue by suggesting that during periods of decreased activity, CoPs should focus on idea sharing forums and tool-building projects.

The chairs identified the necessity to further enhance the dissemination of TG findings. This aspect was examined in the previous TG research project (Matsumoto 2006), which resulted in the compilation of a form for TGs to document objectives and deliverables, and a TG reporting schedule. Although the form and schedule had been utilised by the TGs, the chairs were in agreement that these needed to be kept updated. There were two main meetings for the TGs to present and discuss their work outside of the group; a monthly management meeting, and a lunch time meeting for presentations to the whole organisation. Although only a few TGs had presented at both meetings, the chairs demonstrated a desire to regularly report on their work, and stated that this would create a greater awareness and recognition of TG successes. They stated that a clear reporting process would enable them to keep the organisation updated on TG work on a regular basis.

The chairs were in general agreement that TGs should make greater use of the existing technology available to them. Some TGs had utilised the company Intranet and videoconferencing, however this was not done on a regular basis. One chair stated that several

experts in the subject area of their TG were located at one of the international offices, but had not been involved with the TG via videoconferencing due to the *ad hoc* nature of the TG meeting regularity. The chairs acknowledged that the company is implementing an Enterprise Content Management (ECM) IT system to help it build on its KM capabilities, and that this will provide the TGs with valuable collaboration and knowledge-disseminating tools.

Although the chairs did not feel pressurised to deliver tangible outputs, the TGs that were tackling issues closely related to the business plan were under more pressure to deliver, with one TG included in a regular auditing process. The chairs also stated that greater awareness of TG deliverables would create more opportunities for the business to identify TG successes.

## FINDINGS FROM THE COMPANY DIRECTOR FOCUS GROUP

The key TG chair findings were presented to the directors to gain an understanding of how they felt TGs supported the business, and any solutions or recommendations they had for enhancing the effectiveness of the TGs.

The directors explained that the company has made on-going efforts for a number of years to support TGs, and that they were keen to understand how management approaches can be improved to maximise the potential of TGs. Although many TG successes were acknowledged, they recognised that more TG benefits could be realised across the business. The directors acknowledged that TG findings should be disseminated across the business more widely to enable a better understanding and awareness of TGs. They identified the implementation of the new ECM system as a facilitator of this. The directors also stated that for effective KM, face-to-face contact including TG meetings and presentations, are equally as important as an IT system for collaboration and communication.

The directors recognised the importance of sufficient time for TGs, although they highlighted the importance for TGs to present a business case to justify the necessity for additional resources. They added that closer collaboration with TG chairs would enhance the communication of TG objectives, and therefore anticipated TG deliverables, making it easier to assess the necessity for allocating specific office hours rather than lunch breaks to TGs.

The directors acknowledged the efforts made during the previous research project (Matsumoto 2006), and the necessity to sustain the use of the TG form and reporting schedule. They suggested that although it is important for most TGs to meet regularly, some may only need to meet once or twice a year. They identified the potential of the monthly technical meeting for TGs to disseminate their findings, which was also highlighted by Matsumoto (2006), and stated that it would provide valuable feedback for TG projects. The directors were keen to monitor TG outputs and suggested that a six-monthly or annual 'TG review' meeting should be set up to enable them to assess TG deliverables.

The interview and focus group responses emphasised a number of CoP requirements, the analysis of which revealed interesting parallels between TG chair and director view points.

## CONCLUSIONS

The research objective was to consider the critical success factors for technical CoPs within an engineering design consultancy. An analysis of the data collected identified several key considerations, which need to be made by those involved with the management and day-to-day operation of CoPs within an engineering design consultancy. The two sets of responses confirmed the importance of the CoP success factors identified in the literature, and highlighted a number of methods for their application. These are as follows:

### CONSIDER COP MEMBER REQUIREMENTS

The enthusiasm and commitment from CoP members, and leaders in particular, is vital for CoP success within any organisation. The requirement for CoP members who have a wealth of

experience as well as those who are inexperienced must be carefully considered. The necessity for CoPs within project-orientated organisations to tackle complex project issues means that highly-skilled and experienced employees should be identified as potential CoP members.

### ESTABLISH BOTH SHORT AND LONG-TERM CoP OBJECTIVES

While short-term objectives may concern current (project) issues, which can be effectively established by the CoPs themselves, long-term and more strategic objectives are also necessary in order to sustain CoP effectiveness, requiring high-level input. Because CoPs within project-orientated organisations tackle very complex problems, the specifics of CoP projects do not need to be reviewed at a strategic level. However, regular middle-management support and guidance for CoP projects is vital.

### ESTABLISH REGULAR CoP MEETINGS AND EVENTS

Although CoPs should determine their own meeting regularity based on what they hope to achieve, this should be communicated and agreed at a high level within the business. By doing so, the regularity of meetings can be encouraged and maintained, the profile of a CoP can be raised, and support for it sustained. To build and sustain an organisation's knowledge base, regular CoP meetings should be held even during periods of reduced activity.

### PROVIDE SPECIFIC TIME ALLOCATIONS FOR CoPS

Allocating specific 'office hours' for CoPs within project-based organisations can help to ensure that members, and in particular CoP leaders, can commit to CoP work. It also provides visual recognition that CoPs are a valuable organisational resource. Aligning CoP objectives with the organisation's strategic direction can provide justification for these time allocations.

### FACILITATE REGULAR COMMUNICATION OF CoP WORK

It is important to provide CoPs with clear processes and opportunities for communicating their work. This can help raise CoP awareness within the company, and enhance high-level support and the subsequent allocation of resources. By ensuring that activities are regularly communicated outside of the CoP, there is more incentive for CoPs to ensure that objectives are kept up-to-date and deliverables are monitored.

### CONSIDER THE USE OF SUPPORTING TECHNOLOGY

Although technology may be necessary to support the collaborative features of CoPs and the dissemination of their findings, the most important aspect of CoPs is the face-to-face element.

The research has highlighted the necessity for both operational and strategic perspectives to achieve a balance in the composition of CoPs, their objectives, activities and deliverables. The findings highlight a number of critical success factors for CoPs within an engineering design consultancy, and best-practice approaches for their implementation. Further research will be carried-out with the sponsoring company to assess the application of the findings outlined in this study to its CoPs. The research will examine CoP best-practice within other technical-orientated organisations, both within the construction industry and external to it.

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