

CHALMERS



Mapping Knowledge Sharing Activities within Professional Networks

A Case Study of a Consultancy Company in the
Construction Industry

*Master of Science Thesis in the Master's Programme Design and Construction
Project Management*

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Department of Civil and Environmental Engineering
Division of Construction Management
CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden 2014
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ABSTRACT

Within knowledge intensive companies such as a consultancy company the greatest resource is the employees knowledge. Therefor it is of interest for these companies to understand how knowledge emerges and how it transfers between employees. Original ways of management have proved unsuccessful due to the complexity of knowledge. The purpose of this case study has been to investigate how employees in a consultancy company within the Swedish construction industry share knowledge and learn within professional networks. Through interviews with members from different networks and a questionnaire reaching a broader group it was possible to grasp a holistic perspective of how these professional networks live and function. It was found that the company sees knowledge as an asset today and that they therefore have tried to manage it and the sharing of it through information communication technologies. The social processes found in the professional networks give evidence for knowledge as a term more complex needing other ways to be managed. Further research on how the professional networks can function more effective and how the communication within and between them can be clearer is needed.

Key words: Knowledge sharing, communities of practice, social processes.

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Preface

This Master's Thesis was conducted during the autumn and winter of 2013 as a final part of the Master's Program *Design and Construction Project Management*. It was through the course *Knowledge and Learning in Project Organizations* held by research assistant Martine Buser that my interest for knowledge sharing grew. When I worked at a consultancy company the summer after, I started to see theory in practice. This gave me many ideas for a thesis and I chose to investigate how the company used their knowledge sharing tools.

First of all I want to thank my supervisor, associate professor Pernilla Gluch, for her guidance, theoretical knowledge, support and understanding. Writing a Master's Thesis alone was harder than I thought and having Pernilla's belief in me was one of the reasons for this thesis to succeed.

I also want to thank all the people at the company who took their time to be interviewed and to those who answered the questionnaire. Without their participation there would not have been any results to analyze. Especially thanks to Magnus Calén for guiding me in the right direction within the company and for sharing results and thoughts from an internal study that was being performed at the same time.

Gothenburg April 2014.

Camilla Godborg

1.1 Introduction

Knowledge and knowledge management are terms that have been given increased attention since the 1990's (Styhre 2003). One reason for this is that within strategic management literature, knowledge has been defined as a competitive resource to organizations (Alavi & Leidner 2001). What is important to notice is though that knowledge in itself is not what makes organizations competitive but it is rather the application of already existing knowledge to create new knowledge that is important (Alavi & Laidner 2001). Another reason is the growth of software programs, IT, and information communication technologies (ICT) which has made the world more global and created new possibilities for people to connect.

Knowledge is an important resource for organizations that are knowledge intensive such as consultancies, law firms, and advertising agencies (Newell et al. 2009). For them it is of interest how best to manage knowledge. Researchers do however argue whether knowledge can be managed or not. Some tend to believe that knowledge is a tangible asset that can be codified, stored and transferred easily, whilst others see knowledge as something more abstract that are dependent on other factors such as culture, social structures, language and power. Wilson (2002) goes as far as to say that knowledge management is nonsense and that the term knowledge only has replaced information as a synonym with no new meaning.

Knowledge intensive companies have tried to solve the knowledge management question by using more advanced ICT tools but along with Wilsons (2002) discussion this means that they only have strived for the sharing of information. Lately researchers have therefor been drawn more to the social aspects of knowledge in order to find a way to manage it (Newell et al. 2009). Communities of practice is a theory developed by Wenger (1998), that studies how people learn through engaging in a community and creating shared understanding through social interaction. In an organization we can though find different communities of practices where its members needs to collaborate across knowledge boundaries to solve complex tasks. Therefore networks with members of different communities have become yet another theory on how to manage knowledge (Hansen 2002).

Companies within the construction industry carry out most of their work through projects, where members from different fields of practice need to collaborate to build complex constructions. By organizing in a project structure a company can solve problems more efficient than a traditional bureaucratic structure would have (Styhre 2009). The project form of organizing also implies that innovation within the company is inhibited since project managers focus on the goals of the project and are often constrained by a tight budget.

1.2 Background

This case study focuses on a consultancy company within the construction industry in Sweden. At the office in Gothenburg the consultancy company, here after called CC, have approximately 560 employees who all have a high education and work with complex problem-solving tasks. According to Newell et al (2009) a company that *“competes on the basis of their ability to create, apply and share professional and discipline-based knowledge”* can be seen as a knowledge-intensive firm. CC is dependent on their employees' knowledge to create value for their customers and therefor they have recognized a need to make sure that no knowledge is lost and that people learn from previous projects. Another aspect is their approach to deliver

overall solutions, meaning that collaboration among employees within different fields is important.

In order to manage this task they have implemented different ICT systems. One is the quality system where CC describes the company and all its processes from getting their marketing done to delivering a project with high quality. The other system is the Intranet where all projects are registered and most project documents are kept. In the Intranet employees can also create networks with themes that interest them, both professional and social. On the Intranet it is stated that:

The professional networks aim to share goals, interests, problems and/or knowledge across the established organization and across projects. Networks should also support the active, engaging and committing dialogue between employees and thereby they further professional innovation. Professional networks can also make Best Practices within a specific field, make overviews of competencies within a specific field, and suggest new professional areas of development.

The company in Sweden is structured as can be seen in Figure 1 below. The greater quantity of employees can be found in the lower parts of the organization. Under each division there are a number of different departments and under each department employees belong to a group. Even though the organization is structured this way it does not necessarily mean that employees within a group work together, since they often are engaged in projects they need to connect with colleagues from other groups, departments or even division.

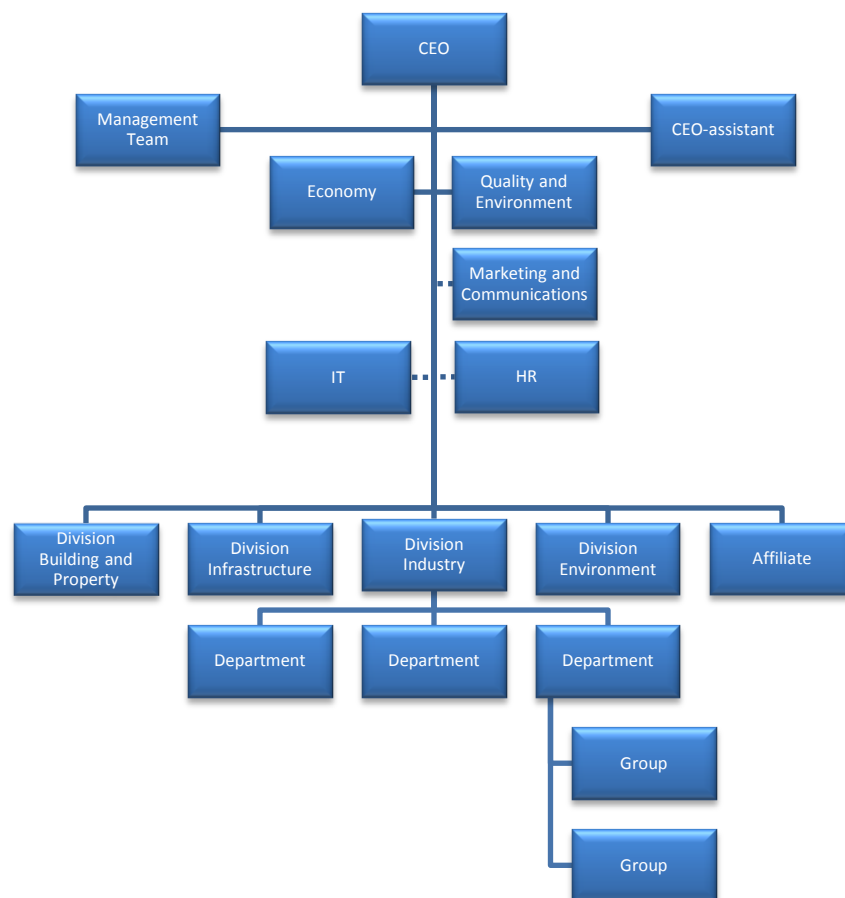


Figure 1: Organizational Structure

An internal project team at CC, consisting of five members from three different divisions and the quality and environment staff, has looked at the challenge they face concerning knowledge sharing among employees. Their pre-study has found three main reasons to why knowledge sharing does not occur and that is seen to be most economical to solve:

1. A routine where knowledge and experiences are shared in the end of a project,
2. Difficulties with searching and finding experiences, and
3. Lack of focus from management

The internal project team has suggested three solutions to solve these problems. First, experiences needs to be collected where it is up to the project manager to decide when, how often, and how much. Keywords here are planning from the beginning and allocation of time. To be able to make these changes, the quality system needs to be updated in four places. The recommendation here is to adjust already existing processes and routines. Second, distribution of experiences to management, tender managers, project managers, and administrators, needs to function. To solve this they suggest creating a new network on the Intranet where final reports should be searchable through basic facts about the project. Third, management needs to support and demand that these routines are followed and that final documents are produced and delivered. Within this category the project team also highlights that this requirement is only twenty percent of a success factor, the other eighty percent they believe relies on employees change of attitude.

Findings in the internal pre-study are of interest for further investigation. This study will map knowledge sharing activities used at CC and critically analyze how they are perceived to function today. Through interviews it will also discover how and why employees engage in knowledge sharing activities and in what way they learn. Comparing results to knowledge management theories the study will give a holistic picture on how CC work with knowledge management today and why, and also how they might develop this work in the future.

1.3 Purpose

The purpose of this case study is to investigate how employees in a consultancy company within the Swedish construction industry share knowledge and learn within professional networks. Through interviewing two employees from three different networks, a questionnaire to the rest of the network members, and interviews with three quality and environment managers, the study will explore how knowledge is defined, gained, and shared. Findings will be analyzed using a network theory lens created in the literature review in order to understand underlying processes that facilitate or hinder knowledge sharing. The aim is then to propose some guidelines for how the company can increase knowledge sharing in the future.

The questions below have worked as a guideline for this study:

- o How does CC, situated in Gothenburg, work with knowledge management questions today?
- o In what ways does employees, engaged in professional networks, share knowledge and learn?
- o How can CC increase knowledge sharing among employees?

1.4 Outline of the study

The sections above have described why this study is needed and what it will try to achieve. In the following chapters this case study will present a literature review of theories within management of knowledge, which will be used when analyzing findings. After the literature review a description of the case will be given for the reader to better understand the context of the findings. In the method chapter that follows a thorough review of how the study was conducted will be given. This is important in order to make the study reliable and possible to repeat for comparison of results. Thereafter the findings will be presented followed by a discussion and conclusions.

2 Literature Review

In this chapter a literature review of knowledge and how to manage it will be presented. The chapter will also give light to how organizations within the construction industry function as project organizations and how this context might affect knowledge management.

2.1 Defining knowledge

When it comes to defining knowledge there seems to be hard to find one sentence that easily describes the term. Even in dictionaries the term is described in a multifaceted way such as: the state or fact of knowing, the sum or range of what has been perceived, discovered, or learned, and specific information about something. However, knowledge is a much more complex term with many nuances that needs to be taken into account (Sthyre 2003). The problem of defining knowledge is not new, as philosophers have had different meanings since the classical Greek period, for orientation see Newell et al (2009). Two distinguishing tracks of thinking have, however, emerged (Cook & Brown 1999). One line of researchers sees knowledge as an asset that can be captured, codified, stored, and transferred while others see knowledge as a process or practice where it is continuously developed in a social context.

Researchers within the IT literature have tried to distinguish between knowledge, information, and data by describing the relationship between them as a hierarchy (Alavi & Leidner 2001). In this view data is defined as raw facts, information as meaningful and useful data, and knowledge as understanding of information (Bierly et al 2000). Alavi & Leidner (2001) do however point out that the transition from one state to another cannot be described that easily since knowledge is information processed in the mind of individuals. The hierarchic view has also been questioned by Tuomi (1999), who argues that the hierarchy should be reversed. In order to create information someone with knowledge has to put data together. Wilson (2002) on the other hand, points out that knowledge is a process of the mind and that if we wish to express this it will only be a message of information. This information might be interpreted and made sense of by others and also influenced by each individual's own perspective and cultural background. These observations show how difficult it is to grasp the term knowledge.

Within the possession view of knowledge, Nonaka's works has been much cited since it illustrates how knowledge can be transferred from tacit to explicit knowledge (Nonaka 1994). These two terms originates from the works of another known and much cited person, Polanyi, who first defined tacit knowledge as: "*we can know more than we can tell*" (Polyani 1983). Tacit knowledge is developed through individuals' own experience within a specific context, whereas explicit knowledge on the other hand is seen as knowledge that has been codified and written down. Nonaka's work build on Polanyi's but in a critic by Wilson's (2002) it is argued that Nonaka has misinterpreted the whole concept and that tacit knowledge never can be made explicit, hence the definition in the first place. To better describe the difference between tacit and explicit knowledge we can take the much used example of learning to bicycle (Cook & Brown 1999). If you try to describe how to bicycle for someone who does not know how, you can explain that there are pedals that needs to be trod with a continuous pace to get forward, that there are breaks to use when wanting to stop, and that there are handlebars to steer with, but trying to describe how to keep balance and

not fall is more difficult. This is a knowledge that we can only acquire by practice or in other words learning by doing. In knowledge management literature researchers have termed this type of knowledge: *embodied knowledge* (Blackler 1995), which means that it is only partly explicit and that we have to be physically present in a specific context in order to learn.

The possession view has also received criticism for other aspects such that it does not take into account power struggles within organizations (Styhre 2003). Within much of knowledge management literature knowledge is seen as something pure and tangible that is unconnected to social practice, whereas in reality knowledge is a social process where meaning is negotiated through sensemaking (Kuhn & Jackson 2008). Another critic is the view on knowledge as a tangible stock that can be valued in money (Newell et al 2009). It is though important to notice that knowledge is not valuable in itself but it is the application of knowledge that creates value (Alavi & Leidner 2001).

The difficulties with the possession view mentioned above have given light to the view of knowledge as a process or practice (Newell et al 2009). Within the process view, knowledge is seen as a continuous process where individual judgment, experience and culture influence how information is interpreted (Newell et al. 2009) and within the practice view knowledge is seen as something constantly negotiated between individuals in a social context through practice (Orlikowski 2002). In the same way as explicit and tacit knowledge have been distinguished, discussions on the difference of knowing-that and knowing-how can be found (Styhre 2003). Knowing-how is learnt through using knowing-what in practice (Orlikowski 2002) and as Styhre (2003) points out it is possible within English language to see knowledge as a noun and knowing as a verb.

Discussions put into light above, and made explicit, about the term knowledge shows that knowledge is a term with many nuances difficult to capture in one sentence. In the following writings, knowledge will be seen as a process or practice rather than something tangible. Although this study will focus on knowledge sharing within professional networks it is important not to forget that knowledge cannot be isolated but that the whole of an organization, its culture, structure, values, norms, etc., affects how knowledge is shared.

2.2 Managing knowledge sharing processes

Since knowledge is seen as a competitive resource to many organizations in society today, questions on how best to manage knowledge is of great interest. Hence, knowledge management has become a popular term and field of research. Depending on how knowledge is defined, different views on how best to manage knowledge applies (Alavi & Leidner 2001). Turning to the tension between tacit and explicit knowledge discussed in the section above we understand that codified, explicit knowledge will never be enough to accomplish a task (Newell et al 2009). Therefore, when managing knowledge it is important to remember the combination of tacit and explicit knowledge. According to Wilson (2002) most studies on knowledge management between 1997 and 2002 seems to fail to distinguish knowledge from information. He goes as far to say that researchers have only used knowledge as a synonym to information in order to create a new management fad.

2.2.1 Trying to manage knowledge with ICT

It has been found that organizations try to manage knowledge by using Information and Communication Technologies (ICT) (Yuan et al 2013). In a study by Ruggles

(1998) 431 organizations responded on how they manage knowledge. The most popular tools used were all related to ICT. By social pressures, organizations are today expected to have ICTs in order to be seen legitimate (Newell et al. 2009). Here it is important to notice that these systems do not only have a purpose to facilitate sharing of explicit knowledge but often consist of different programs that support the daily work within the organization. It has also been shown that ICT systems do not always fulfill user expectations (Hinds & Pfeffer 2003). One reason for this is that ICT tools, such as enterprise systems and Intranets, define knowledge as an asset in line with the possession view (Tseng 2007).

Another aspect of the use of ICT within organizations is that it is shaped by the users (Orlikowski 2000). There are multiple ways to use technologic tools and they can be interpreted and made sense of in many different ways (Weick 1995). What is important to remember is that we cannot analyze the use of technologies separately and that organizations are complex constructions with rules, values, norms, beliefs and assumptions (Barley & Tolbert 1997). Implementing new ICTs will therefore not solve an organization's knowledge management problems in itself (Newell et al. 2009). Another critique of ICT is that most of them are packages, such as Microsoft's popular SharePoint, that support knowledge sharing processes (Newell et al. 2009). These packages are often developed by software consultants, who analyze and benchmark work processes, which they then implement in the software as so-called 'best practice' (Gratton and Goshal 2005). Therefore organizations are advised to not make a lot of changes in these systems (Newell et al. 2009). However, as seen in the sections above, there is no 'best way' to manage knowledge within an organization.

How an organization is structured affects knowledge sharing (Newell et al. 2009). A structure that facilitates interpersonal communication and interaction is seen as one of the elements to create a context for knowledge sharing and innovation to occur (Claver-Cortés et al. 2007). Developing from Mintzberg's (1979) adhocracy structure, researchers such as Drucker (1992) and Morland (1995) have argued for a more organic, flexible, and informal design of organizations where communication flows horizontally. Development in ICT has created opportunities for more organic designs (Newell et al. 2009). However, a paradox is that these new structures also create knowledge loss since a horizontal structure often implies lowering the amount of middle managers whose main task often has been to coordinate work. Another paradox similar to this is that ICT has created possibilities for organizations to expand globally (Newell et al. 2009). When it comes to business and communication, face-to-face interaction does though seem to be preferred over using ICT, since communication is much in body language and it facilitates trust (Rhoads 2010). Further, studies on how ICT tools such as platforms and channels (Davenport 2005 and McAfee 2006) have shown that to find information through Intranet (platform) is perceived as complicated, and that employees rather prefer communication channels such as e-mail to share knowledge. Again, use of e-mail can also cause problems such as overload and disruptions (Davenport 2005).

The discussion above gives light to some of the weaknesses with ICT tools when managing knowledge processes. Hence, for effective team-work and knowledge sharing to occur, focus needs to shift to practices where community-building and social networking is centralized and where ICT systems only are seen as supporting tools. Newell et al. (2009) argue that there are two main lines of research within this field; (1) networks as communities, and (2) networks as channels. These theories will be briefly described in the following sections.

2.2.2 Networks as communities

Since knowledge is perceived to be shared and learnt through negotiation within a social context, communities of practice (CoP) as a concept has received increased attention within networks as communities research, for orientation see Johansson (2012). CoP has been defined as *“a group of people informally and contextually bound in work situations who are applying a common competence in the pursuit of a common enterprise”* by Schenkel et al. (2001). This definition describes the informal organization that daily apply to solve problems where members rely on story-telling, conversation, mentoring and experimental learning. Within a community of practice knowing consists of two components; competence and experience (Wenger 2000). Wenger defines competence as legitimate knowledge within the community and experience as our participation in the world. Hence, in order for knowledge sharing to occur valuing what another person knows in relation to one's work becomes important (Borgatti & Cross 2003). Identification with a community and sharing the same repertoire has been found to be fundamental and these are maintained through narration, collaboration, and social construction (Brown & Duguid 1991). These informal processes need to be acknowledged in order to bridge the gap between actual practice and espoused practice.

A member of a community is thought to have access to the community's knowledge (Brown & Duguid 1991). Therefore CoP has become a popular way to study organizations and their work with knowledge management (Johansson 2012). Since communities of practice emerge and live organic lives they are though difficult to manage. What managers can do is to provide a fruitful context for these communities to develop by encouraging, supporting, and acknowledge them (Wenger 2000). Another important aspect is that organizations often consist of many different communities of practice (Johansson 2012). When each focuses on their own tasks they create boundaries between each other (Wenger 2000). Carlile (2002) explains *“the characteristics of knowledge that drive innovative problem solving within a function actually hinder problem solving and knowledge creation across functions”*. This paradox implies that knowledge sharing between different disciplines is hindered by knowledge itself (Newell et al. 2009).

Knowledge boundaries can be found in differences in language, vocabulary, artifacts, ways of working, and sets of experiences (Johansson 2012). They can be seen as concrete boundary objects such as blueprints, drawings, or prototypes or they can take a more abstract form such as visions and symbols (Newell et al. 2009). Working in multi-disciplinary projects knowledge boundaries can be found between the different practices and these have to be overcome in order for the project team to succeed, but Newell et al. (2009) also highlights the consequences this have for the organization. Introducing learning boundaries they explain that the more knowledge boundaries a project team has to tackle the more difficult it gets for the organization to learn from the project. In Figure 2 it is shown where the knowledge boundaries and the learning boundaries can be found within the organization.

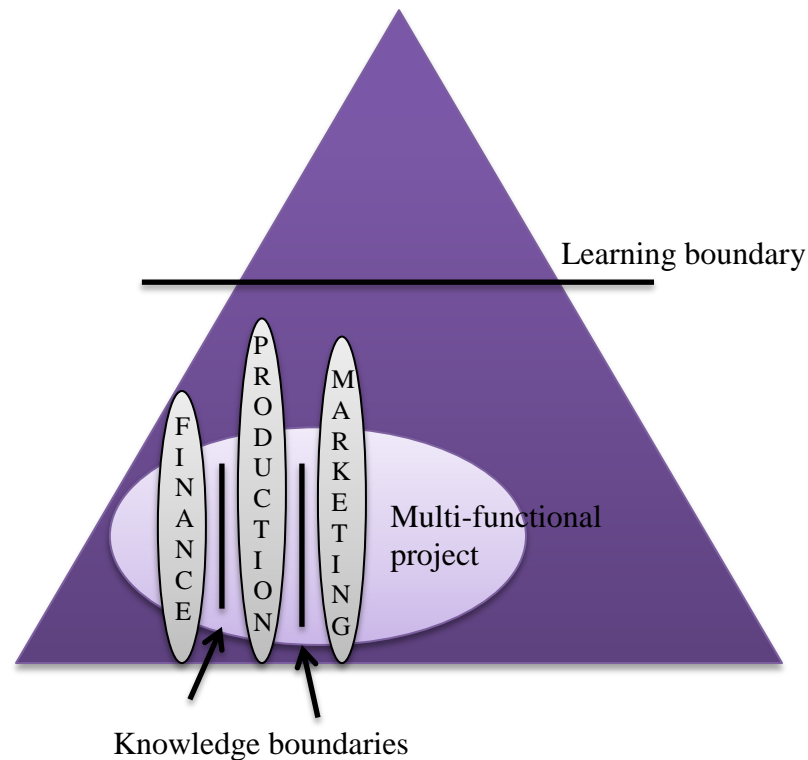


Figure 2: Learning and knowledge boundaries (Adapted from Newell et al. 2009)

Seeing the triangle as the organization and within the context of a consultancy company in the construction industry we might replace finance with construction, production with geotechnics, and marketing with project management. In multifunctional projects these different CoPs needs to collaborate.

To overcome knowledge and learning boundaries people who can mediate between different communities of practice or participate in multiple communities of practice are needed (Johansson 2012). Brown and Duguid (1998) explain that these can be seen as translators or knowledge brokers. These need to be knowledgeable within different communities in order to gain trust by its members. It has been found that the knowledge sharing process between communities of practice can be facilitated through knowledge brokers engaging in social networks, informal meetings and workgroups (Teigland & Wasko 2003). Networks as channels will therefore be presented briefly in the following section.

2.2.3 Networks as channels

Reviewing studies on knowledge networks as channels, it has been found that these tend to focus on either the links between people or how people's knowledge are related (Hansen 2002). Describing an efficient knowledge sharing process through networks has though been found to claim both short path lengths between knowledge workers and the related knowledge that these possess. This means that a "know-who" description of knowledge can be applied (Borgatti & Cross 2003). Within this view of knowledge the function of relationships is taken into account. In their study, Borgatti & Cross (2003) found three relational characteristics that facilitate information seeking: (1) knowing what another person knows, (2) valuing what that other person knows in relation to one's work, and (3) being able to gain timely access to that person's thinking.

Studying the relations between members of social networks researchers often discuss the role of strong and weak ties, for orientation see Reinders (2011). Strong ties develop over time and are trust based. These have been found to be more efficient when transferring tacit types of knowledge. Weak ties on the other hand are better at transforming explicit types of knowledge and to be a source of new information. Granovetter (1973) coined the “strength of weak ties” theory, which implies that weak ties are more likely to connect members of different networks fulfilling a bridging function, and diffuse new ideas.

When it comes to knowledge sharing within networks, researchers have also focused on the diversity within them, for orientation see Cummings (2004). There seems to be discussions about whether demographic diversity or structural diversity benefits a network or a group. Demographic diversity appears when members are different when it comes to sex, age, nationality etc. Networks that have a high level of demographic diversity tend to focus on group processes such as conflict solving, communication, and social interaction (Jehn et al. 1999). The consequences have been found to be rather negative, and distracting the group from problem solving linked to the actual task (Williams & O'Reilly 1998). Structural diversity on the other hand means that members within a network are different when it comes to: (1) geographic location, (2) functional assignments, (3) reporting managers, and (4) business units (Cummings 2004). A group or a network with structural diversity is thought to support members with sources of new information relevant for the task, know-how, and feedback and it have been found that a higher level of structural diversity increase performance (Cummings 2004).

2.3 Knowledge Sharing within the Construction Industry

Within the construction industry, work is performed mostly through projects (Styhre 2009). A project is *“a unique process, consisting of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements including the constraints of time, cost and resources.”* (ISO 2005). Projects have the possibility to integrate people with different knowledge in order to reach a common goal (Pemsel 2012). It is also a way to solve problems that traditional bureaucratic forms of organizations would be unable to do (Styhre 2009). The definition does however also imply a specific context for knowledge sharing within project-based organizations (PBO) where it is difficult to transfer knowledge from one project to another or to the rest of the organization (Pemsel 2012). Knauseder (2007) points out that a construction project can be divided into four phases: idea and evaluation, design, production, and utilization. In theory each phase is finished before the next start but in practice they often overlap each other. Another realization is that the project organization change with the change of phase and that people come and go depending on what knowledge is needed at the time. One of the conclusions in Knauseder's (2007) study was that personal networks are a good strategy for knowledge sharing to occur in and between construction projects.

3 Description of Case

CC is a consultancy group with head office in Copenhagen supplemented by 11 other offices in Denmark and 35 branch offices in Asia, Europe, the Middle East, Africa and the Americas. About 6 000 people around the world are employed by CC delivering consultancy services within the fields of engineering, economics, and environmental science. It is an organization that works mostly through projects and has carried out 50 000 projects in over 175 countries. In Sweden there are 14 offices located in different cities with the main office in Gothenburg where about 560 employees work. In 2009 the CC Group had a turnover of 536.6 million EUR. Of these facts we learn that CC is a huge company selling knowledge-based services around the whole world throughout projects. Knowledge is an important resource within the company and in the following section a description of the different ways they try to manage knowledge will be given.

3.1 Knowledge sharing systems at CC

CC works with knowledge sharing and collaboration in two different ICT systems. They have a quality system and an intranet. The quality system tries to describe how CC works by illustrating ten main activities. Under each main activity several layers of more detailed process maps can be found, linked with arrows and structured from the beginning to the end, see Figure 3. Processes describe when an activity shall take place, why it should be performed, what are supposed to come out of it, and with what tool it should be done. All processes has an owner and an author who are responsible for uploading and updating documents and make sure they are relevant. Examples of documents are best practice examples, checklists, routines and templates. CC see the system as “the way we work” and this platform is supposed to be the single source of truths, which means that information about everything from how to register time to contracting a client should be performed in line with the quality system and kept in one place. Since it is difficult and time consuming to describe the company as a whole, the system focuses on the processes that are of critical importance to secure quality. Six sigma and Lean production are approaches that have been kept in mind when developing the system and also the process maps has been chosen instead of flowcharts to ease the readers’ understanding. This is a system that is being used at CC in Sweden, since it started to develop in 2004, before the company was bought by the consultancy situated in Denmark. CC Sweden are now trying to build a similar system in English that can be used in CC group. In addition to the processes maps we can also find toolboxes linked to each technical division within the company. These toolboxes are filled with guides, checklists and other documents that are specific for that technical field.

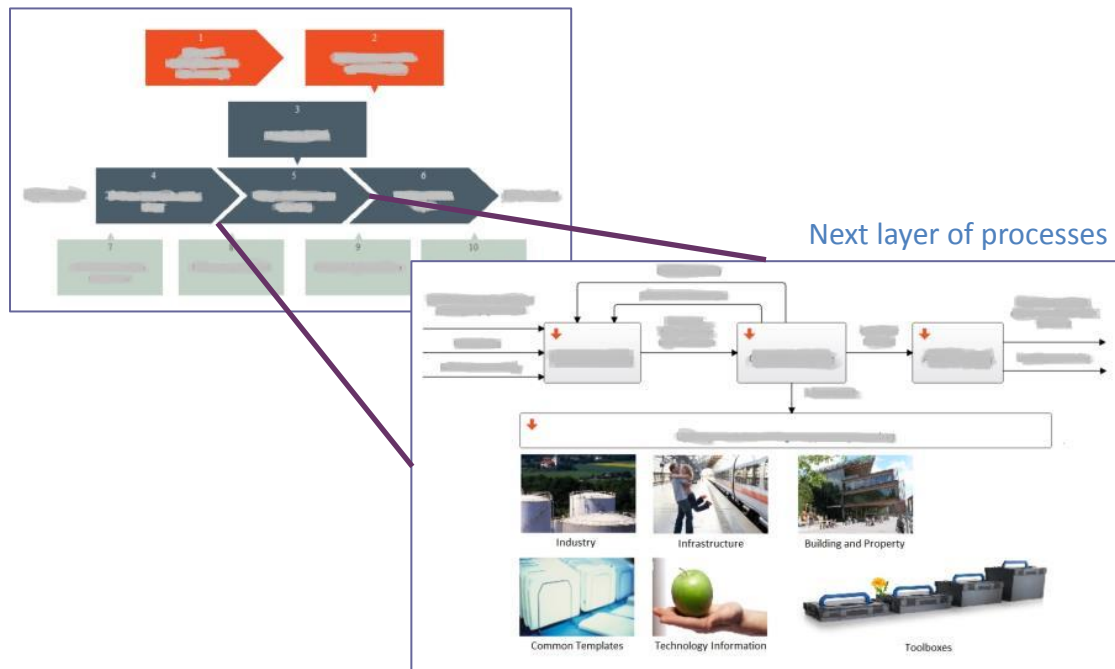


Figure 3: The quality system with ten main activities and an example of underlying processes.

Within the intranet we find both project sites and network sites. When a project has been contracted with the client it is registered and shows up in the intranet as a project site. This gives the project a number that is linked to the economic system and work done in the project can then be charged the customer. Each project site needs to be managed by an assignment manager who adds people to the project and develop the site to include the functions that the project needs to continue. These functions can be; a forum where questions can be asked, it can be a news column where all changes appears and so on. All project documents are saved here except for large files such as CAD files and PDFs with many pictures, which need to be saved in the projects O: drive. The thought with the project site from the beginning was to have all documents in one place but since the system cannot handle large CAD files this is not possible today. The intranet that CC uses today was implemented when the Swedish consultancy was acquired by CC group in 2009. Along with this the conditions for projects changed to a more open base. In the intranet all projects are open to employees unless they have been closed due to secrecy. Compared to the system used before where only project members could access project documents the intranet provides a platform where members openly can share information.

The network sites are not very different from the project sites, the same functions can be used here and employees can choose different tools that they want to apply, see Figure 4. A network can have several owners who can change the layout of the pages and all members can add and change documents if nothing else has been said or restricted. There are both professional networks and social networks within the intranet. The company's aim with the professional networks is to create a space where employees can share goals, interests and knowledge across the organization and projects in order to create an active dialogue between employees that nurture innovation. Each network needs to have a manager who plays the role of an administrator. Networks are today not connected with the rest of the organization; meaning that time and energy used when working with the networks do not bring any measurable value to the organization. Social networks vary in a wide range of fields

and connect people with the same interest that does not necessarily have anything to do with the organization and daily work.

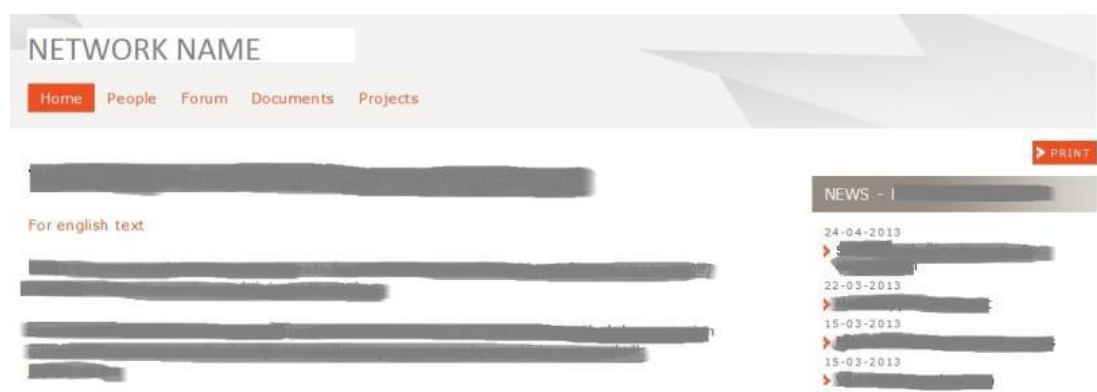


Figure 4: Layout of network sites within the intranet.

3.2 Professional networks at CC

In the following sections each of the three chosen networks will be presented separately in order to give the reader a deeper understanding of their purpose and function.

3.2.1 Bioenergy Sweden

Within CC it is usually the group manager who is responsible for sales and bringing in new projects but since Bioenergy is a new field that is supposed to expand they decided to hire three employees to work 50 percent in projects and 50 percent with marketing and sales. These then decided to start a network. Today there is only one person left who still is assigned to work with the network for 50 percent of the employment time since one quit and another were engaged in a project. Bioenergy Sweden is a network with 26 members from different departments in Gothenburg, Karlstad, Malmö and Stockholm in Sweden, and Fredrikstad in Norway. The network has a clear goal to increase the collaboration within the field of Bioenergy in Sweden independent of where members are located in order to give customers an optimal overall solution. It is an active network where documents from events, meetings, customers, projects etc. are posted continuously. This network was chosen to investigate further due to the manageable size and the high level of activity. From the first look it seems like a well-functioning network that has a potential to grow.

3.2.2 Theme contaminated sites Sweden

Theme Contaminated Sites is a network that existed already before the new intranet was introduced in Sweden in 2009 and it was management who decided to keep the network and therefore assigned a network manager to create it in the new system. The network consists of 34 members from within mostly the same department in Gothenburg, Helsingborg, Jönköping, Malmö and Stockholm. The network has a description that presents a list of what members work with and also we can find a detailed list of who members are and which office they belong to. There are some documents posted in the network among them a strategy plan for getting more jobs. On the other hand no documents give evidence that meetings take place and thus the network has been chosen to investigate further in order to find how they work and what their goal is.

3.2.3 Calculation

Calculation is a network that after some time of loose discussions was created by a group manager who at last got tired of all the talk about that such would be a good idea but nothing happened. 16 employees from different departments in Gothenburg are members of the Calculation network today. This is a network that exists to increase the quality of calculations and facilitate knowledge sharing amongst employees of different departments within CC. The network has clear goals but lack a description of how they are going to achieve these. So far the network has not produced many documents and it has been chosen in order to investigate how it can be developed and what factors that needs to be in place to make it work.

4 Method

In order to understand how CC works with knowledge management questions today and how they can develop, a case study of three professional networks within CC has been performed. In order to select which networks to study a general analysis of all 53 professional networks in Sweden was conducted (see Appendix 1). Criteria when picking out the networks were: the number of members, amount of material documented on the network site, and date for latest activity. The three networks chosen are of different character in order to compare and reflect upon why one network function better than another and what reasons there might be to this development. The study aims to find if knowledge is shared amongst members and how, how well the knowledge management systems are thought to work and what, if anything, needs to be developed.

In each of the networks chosen, two members of the core were interviewed. The interviews had a semi structured design in order to let the interviewee elaborate questions further and by this be able to pick up information that otherwise would be left out if not asking the exact question. Semi structured interviews were also held with three employees from management in Gothenburg who works with quality, environment and safety. Interview questions are attached in Appendix 2 and 3. Interviews were held in the interviewees' offices or a place of own choice, in order to secure an environment where they felt relaxed and comfortable.

In addition to the interviews a questionnaire with twelve questions was given to the rest of the network members in order to pick up information from another angle than the core members perspective, see Appendix 4. In total the questionnaire were delivered to 67 employees and out of these 27 answered which gives a response rate at 40.3 percent. Table 1 shows the responses in numbers of network members.

Table 1: Number of respondents within each network

Network	Number of respondents
Bioenergy Sweden	12
Theme Contaminated Sites Sweden	7
Calculation	8
Total number of respondents	27

This method is thereby mixing qualitative and quantitative research methods. Researchers have different views on whether this is feasible or not. Some researchers argue that each of the methods is committed to an epistemology and that which method is chosen depends on what to be studied (Bryman & Bell 2011). When studying social phenomena a qualitative research method is often used since it strive to give a deeper understanding of the situation studied. The quantitative method is in this case used to complement the qualitative study in order to gather information from a larger group. A questionnaire is also a good way to get answers in questions that are straightforward and therefor the results could provide some statistics. By mixing the two methods the study broadened its perspective by reaching out to more people that otherwise would not have been possible due to time constraints.

5 Findings and Analysis

In this chapter, findings from interviews with network members, interviews with quality managers, and the questionnaire, will be presented and analyzed by using a network theory lens. The following section focuses on the interviewees and respondents thoughts on what knowledge is and how they learn. The second section will give a deeper view on how the knowledge management systems actually are used and after a general perspective the results will be divided into the networks to capture how they differ. In the end, the last section will highlight other factors that affect knowledge sharing.

5.1 Employees view on knowledge and experience

In the questionnaire employees were asked to reflect upon what knowledge means to them. From the survey the answers varied a lot but four different categories of definitions could be found. First there were a large group who compared knowledge to hard facts and information that they knew, or knew where to find. Some within this group also connected knowledge to something they could find in books or read on the Internet. In the second group respondents focused on knowledge as something learnt through school or courses and that they could make use of. The third category of respondents connected knowledge to experience and stated that it was something that had become their second nature. This group also saw knowledge as understanding the big picture. Lastly there were a few respondents who connected knowledge to the process of creating new knowledge and explained that it was something that was continuously exchanged with others.

The interviewees were also asked to define what knowledge means to them. Answers differed but most seem to fit into the categories mentioned above. Some other perspectives on knowledge could also be found where one interviewee recognized knowledge as one of five competencies. Ability, aptness, will, and requisites were the four others and knowledge where then seen as a fifth of a person's competence. Then there was also explained that people are different when it comes to approaching problems, some like to investigate first and then try while others like to try first and think after. Another perspective was that knowledge is tightly connected to experience and that after many years you know what to do through your own gut feeling. To another interviewee knowledge meant understanding and being able to explain the knowledge to another as seen in this quote:

Knowledge to me is that you know something and that you also have understood it, not only knowing that something is 4 but also understand why it is 4. And also that you can pass it to others, that is knowledge.

An interesting observation were that the interviewees from the quality, environment, and security section saw knowledge as something they had or something they could take part of from the quality system or their colleagues. However, there was no clear definition of the term knowledge amongst the interviewees from management. Even though all seemed to think the quality system was a good place to begin they emphasized the contact with other colleagues and that no system ever can replace that source of knowledge, as we can see in the following quote:

We are dependent on employees' knowledge. That is our capital or investment. We can't replace it with a system but we can complement and support it through the systems.

In the questionnaire people were also asked to reflect upon what experience meant to them. Answers varied within five categories this time. In the first category we find some who explained that experience comes from using knowledge in practice. Further the second group coupled this to mean both from their own practice and from what others told about their earlier work experience. Another aspect, mentioned in the third group, were that employees linked experience to results, both how to value results with gained experience and to, by experience, know when work had reached a satisfying quality. Time was a keyword in the reflections of the fourth group, where they explained that experience is something gained over time by using knowledge and also that it cannot be gained by reading. At last there were some who linked experience to the ability of predicting consequences or outcome when faced with new tasks based on what has happened in similar situations.

5.2 Usage of knowledge sharing systems

One of the questions in the survey asked how often members need to search for information through Internet, intranet, quality system, and colleagues, see the second column in Table 2 below. The respondents could choose on a scale from 1 to 5 where 1 represents very seldom and 5 very often for each of the sources; Internet, Intranet, Quality System, and Colleagues. From the calculated mean values of questionnaire results it is clear that the Internet is the source most often used closely followed by colleagues. The intranet is used less than the two above but perform better than the quality system.

Table 2: Compiled results from the questionnaire of how employees search for information.

	How often do you need to search for information through the different sources?	How fast do you perceive that you get the information you were searching for?	How useful are the information received?
Source:	Mean Value	Mean Value	Mean Value
Internet	4,4	4	4
Intranet	3,5	3,1	3,6
Quality System	2,9	2,9	3,6
Colleagues	4,3	4	4,3
Scale 1- 5	1 = very seldom, 5 = very often	1 = very slow, 5 = very fast	1 = of little use, 5 = very useful

The third column shows how fast the respondents perceive that they get the information they were searching for through the different sources, where 1 represents very slow and 5, very fast. Again the Internet and the colleagues are rated as higher than the intranet and the quality system, but this time the Intranet is performing worse. In addition to this information, respondents from the interviews expressed that they thought of the knowledge sharing platforms as difficult to search in and that their first approach to a problem was to search the Internet or to ask a colleague if they thought he or she had the knowledge needed.

However, as we can see in the fourth column, when information finally is found within the quality system and the Intranet this is perceived to be useful although information from colleagues and Internet score higher even in this aspect.

Respondents were asked how useful they found the information received from the different sources. 1 represents of little use and 5 very useful.

These findings do not put the quality system in a good light but in interviews with network members some positive comments have also been made. Employees seem to like the idea with the quality system and understand the importance of everyone saving documents in one place instead of in their own computers. What is seen as a hindrance to the system is that it is perceived as slow due to the structure with owners, authors, and old documents. However this is by management thought of as a necessity to keep documents updated and reliable. If they were to let everyone be able to upload what they wanted they would lose trustworthiness and responsibility for documents meaning that if something were wrong with one document there would be no one to take care of it. Templates and checklists, stored in the quality system, are however seen as more useful since many employees use them and therefore they are regularly updated and relevant for daily work. Several times there has also been commented that the quality system is difficult to search in since it can only be searched on document titles and relies on the seeker's ability to know what s/he is searching for.

When it comes to the Intranet, an interesting observation from the interviews is that some employees seem to not be aware of the change from the old system where all projects were closed, to the new Intranet where openness is the base. Four years after the change people still feel that they are denied access to several documents and intranet sites.

5.3 Network function

In the results from the survey concerning networks, four questions were asked:

- How often do you upload information or ask questions?
- How often does the network have meetings?
- How often do you visit the network site?
- How often do you get information and news from the network?

Members were to answer each question with; daily, weekly, some times a month, sometimes a year, or never. An important note here is that members have to activate a function to get e-mails from the system when something new has happened in a folder or a document. By linking the four questions to the keyword activity and give each of the categories a number from one to five where 1 represents daily and 5 represents never the answers from all of the four questions have been compiled into a mean value for each of the networks as can be seen in Table 3. A higher number means lower activity. From the table Bioenergy Sweden seems to be a little bit more active than the other two with a score of 3,5 compared to 4,1 and 4,3.

Table 3: Mean value of total activity within each network.

Network	Mean Value
Bioenergy Sweden	3,5
Theme Contaminated Sites Sweden	4,3
Calculation	4,1
1 = daily, 2 = weekly, 3 = some times a month, 4 = some times a year, 5 = never	

Another problem concerning the network sites when looking at them in general (see Appendix 1) is that many of them are empty or consists of little information, meaning that there are no or few documents visible and little or non-existing discussion in the forum. The portal manager explained that only documents added as whole number versions such as 1.0, 2.0, and 3.0, can be viewed by non-members. Her perception of the networks is that they are used mainly to share documents, documents that do not fit in to the quality system or project sites, and that, only networks as for example the ones within topics that concern different technical fields are more engaged in spreading their information to others. Since most networks do not connect to organizational work it is up to employees to engage in them and during interviews employees have mentioned that there is a need for enthusiastic peoples' engagement to make the networks flourish.

In the following sections, each network will be presented separately since they are of different character, and also in order to be able to take this into account later in the discussion.

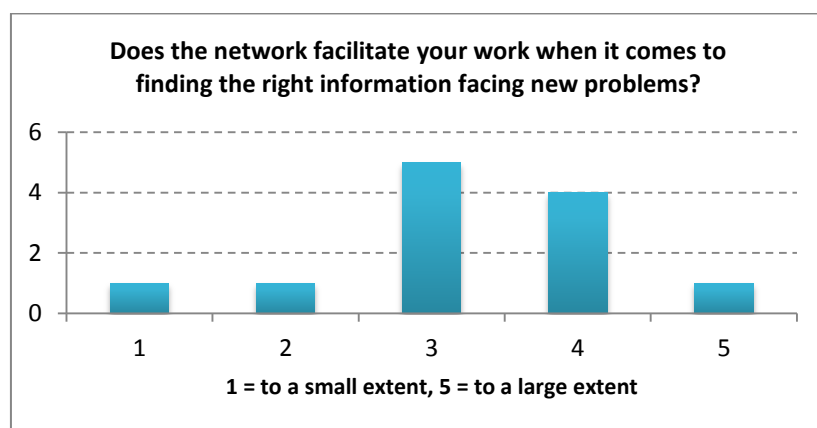
5.3.1 Bioenergy Sweden

When the network Bioenergy Sweden was being created discussions about how the network should function were held and guidelines were developed for how to communicate, what information to have on the site, and structure of meetings. Today there are ten main members of the network and these have monthly meetings via a virtual program where they discuss which projects they are planning to bid on, incoming projects, and progress of already contracted projects. The network manager describe the success factors of a network as own engagement, letting members have an influence, and asking for information when something has happened, like for example a seminar or a conference. She also explains that it is important to be open with all information and add members to the network in order to make them feel welcome. Another factor is the layout of the site, which should be aesthetic, neat and updated.

In the survey, members were asked to define, with own words, why they were a member of the network. Looking at how the members from Bioenergy Sweden answered, interest was a recurrent keyword. Information about this network as a new technical field within CC also became apparent and respondents saw this as an opportunity to become engaged in more projects. This information is aligned with results from the interviews. Even though members are interested and want to engage, they find it difficult to get time to work with the network and they feel forced to prioritize between this type of work and work that can be charged customers.

In the questionnaire, members were asked if they think that the network helps them find information when facing new problems, see the outcome in Table 4. As we can see from the results the network seems like a fairly informative site and combined with the results shown above it is a site that members use. They were also asked to define in what ways the network helps them and here the answers varied. One mentioned that the information found in the network was not well defined and therefore it was hard to start looking there and another had not been a member long enough to answer. All that gave the number three or higher explained that it was finding the right people to ask that was most important although some mentioned that it was more common to ask people in their surroundings and that these people often were the same. On the question about how the network can develop, goals were a keyword. Members wish for more clear and common goals for where the network is heading, and feel that this would increase the networks activity. One also mentions the long-term perspective of the network, meaning that it is often easier for members to take on projects providing an income and seeing the short term goals of the organization, while the network is of benefit for the organization in the long run bringing in new projects.

Table 4: Facilitation of network when facing new problems



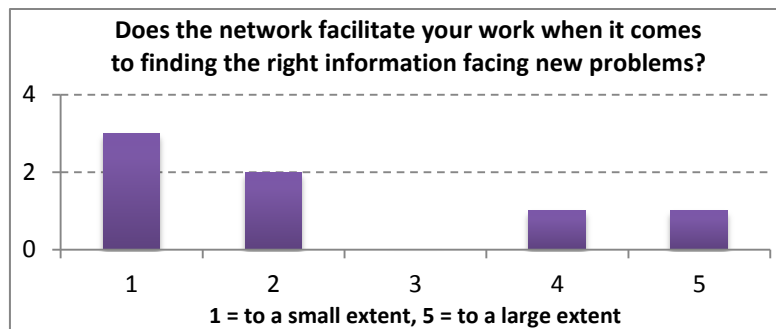
5.3.2 Theme contaminated sites

The network manager described that the purpose of the network has been to share documents and information, such as framework agreements with laboratories, reports, and tables with guidelines, between members around the offices in Sweden. As network manager he is also responsible for finding new information within the field and analyzing the environment, however, during the interview he explains that when he find something interesting, he feels that he often does not have time to read it.

The network does not have any meetings, physically nor virtually, and communication seems to go by e-mail. However, the network manager mentioned that there are similar networks in Denmark and Norway and that at the latest division technology meeting in Denmark it was decided to create a steering group to increase the collaboration. The steering group has decided to meet a couple of times a year. When asked about collaboration among similar networks the other interviewee did not know about that such collaboration existed even though this was something he mentioned could be interesting and fruitful.

Looking at the results from the survey a keyword to why members were a part of the network was work, either that they were working directly with questions within the network theme or indirectly through other fields. Most mentioned that they took part of it to get information and to find relevant documents. When it comes to finding the right information facing new problems on the other hand the network seems to be of little use, see Table 5. Some commented that they rather call a colleague than looking in the network and one mentioned that the network is of good use to find the right people to ask. Another explained that there have been few projects connected to the network lately but that the network has a potential.

Table 5: Facilitation of network when facing new problems



How the network can develop was one question in the survey and in the interviews answers varied from: some thinking the network functions well today compared to its purpose, others feeling that the communication and collaboration between different offices needs to increase, and some argued that more information should be available and that the network could be linked to the division's yearly technology meeting.

5.3.3 Calculation

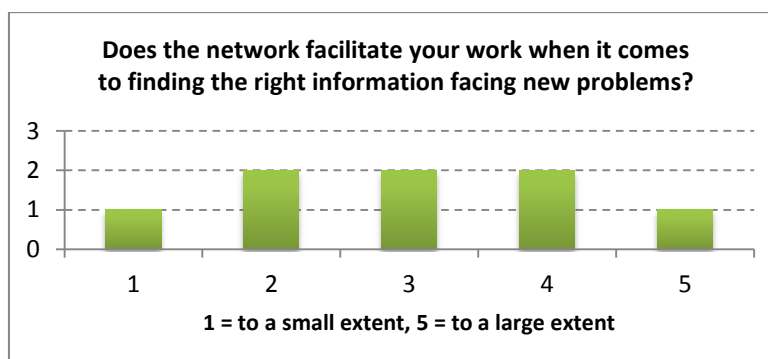
The network manager explained that the network is needed since calculation is not a single technical discipline within the company but that within every division people are calculating. Therefore he believed that a network was needed where everyone who is doing some kind of calculations can meet and discuss around the topic to increase the quality and also to be able to sum calculations from different disciplines to get one for a whole project. In this network there are only 16 members and it does not seem like much activity is going on. However the key members within the network have had three meetings this year and one interviewee explains that he believes the network is supposed to have one meeting per quarter. One reason for why activity is low is a new version of a calculation tool that is on its way, so one interviewee feels that the whole network are waiting for this to come to see how they will proceed.

When asked why members are engaged in the network, interest was a keyword among most respondents but one did not know why, and some mentioned that it is because they work with calculation. From the interview with the network manager it is clear that he is engaged in the network because of interest and because he likes to spread information and to help others get better. The other interviewee explained that he sees it as two networks one that exists on the intranet and one social, he has good contact with the network manager but otherwise it is not often he meets the other members.

In Table 6 below the results for how the network facilitates work when facing new problems is shown. This differs from the others since there are very differing

opinions. In addition there are only a few explanations on how, where some found it easier to find people with similar experience and one explained that the network had not been fully activated yet.

Table 6: Facilitation of network when facing new problems



To sum up the findings extracted from the networks, Table 7 has been created. Creation, purpose, meetings, key word, usage, and development were categories that could be distinguished within each network. This table makes it easier to see how the networks differ.

Table 7: Summary of differences between networks.

Network Features:	Bioenergy Sweden	Theme Contaminated Sites	Calculation
Creation	Employees	Management	Group manager
Purpose	Increase collaboration	Share documents	Increase quality and enable collaboration
Meetings	Monthly	Never	Quarterly
Key word	Interest	Work	Interest
Usage	Find the right people	Find the right people	Find the right people
Development	More clear and common goals	Increase communication and collaboration	Find more members

Looking back at Table 3, these findings now give a better understanding to why the networks differ in activity and function. What is interesting to notice is though that all networks were mostly used to find the right people.

5.4 Analysis of factors that affect knowledge sharing

During the interviews different reasons, to why knowledge sharing did or did not occur to the extent desired, appeared. Time, economy, culture, motivation and demand were some of the main areas that were seen as factors that affect knowledge sharing. Each of these will be touched upon in the following sections.

5.4.1 Time

In all of the nine interviews, time was seen as an important factor to be able to share knowledge. Picking out some quotes from different interviews it is though shown that time is a term defined with different nuances connected to other tangible or intangible aspects, see Table 8 below.

Table 8: View on time

Quotes from interviews:	Time as:
<i>To search for knowledge saves time, it is not a thief of time. That is my view. Obviously everyone does not share this perspective.</i>	An asset
<i>To have a meeting and create an experience report in the end of each project is a routine in the quality system but it is not followed today since the next project has already started.</i>	Something fleeting
<i>When it comes to marketing it takes time to build contacts and you need to take it coolly. At one time the company says that they understand this but in the same time they want us to work in projects.</i>	Having patience
<i>Reflecting upon project outcomes is time-based, if you feel that you have time to sit down after a project, or if there is time and if you feel like it, or if you just hand it over and continues with something new.</i>	Something social
<i>Managers focus maybe a little too much on debiting and are pressed, and then knowledge sharing is done if there is time.</i>	Costs
<i>There are constant challenges for improvement work and we cannot only work with it when we have little to do.</i>	Scarce resource
<i>Time constraints are the reason to why people don't work as much with networks as they would have wanted.</i>	A fence
<i>When I find something useful working on a project I upload it in the network, it doesn't take long time and can often be debited the project.</i>	An opportunity

From the quotes above we understand that time is connected to work in projects and that employees often are stressed and have to fill their time with work that they can charge customers. However, from the interviews, most recognize that knowledge sharing work is valuable in the long run and that they have to be better at taking the time and plan for this. Time is also well connected with economy since consultants work on an open account basis, which is the topic in the next section. Some also expressed how the time-problem, could be solved by creating a budget for knowledge sharing projects.

5.4.2 Economy

The employees at CC are mostly consultants who sell their knowledge to customers. Knowledge is transformed and made valuable to customers through documentation such as pre-studies, calculations, blue prints and other similar reports that help the customer make decisions and build what they want. Consultants often work for clients on an open account and therefore every hour they work on a project can be charged the customer, meaning that CC gets paid and a greater income when employees can charge clients for as much of their time as possible. This is a reality that most employees face and therefore they prioritize to work with projects and see knowledge sharing, meaning in this case documentation and meetings in the end of a project, as less valuable for the company. From the interviews it is clear that there is a pressure from top-down management to deliver good economic values and hence the pressure on employees. One interviewee expresses this pressure in the quote below:

My closest manager who has personal development plan meetings with me, he does nearly only see debiting hours. So if I don't debit, then I'm not doing a good job.

Another perspective that has been prominent is that the consultants get paid anyway. If it takes longer time to produce documentation of the right quality they still get paid until they are finished since they most often are on an open account. One interviewee compares the consultants to contractors and feel that the pressures on doing things right to save time and money have a greater focus within contractor companies. Contractors do most often have a fixed price contract with the client. Below is a quote from an interviewee:

Shall we invest in knowledge sharing and by doing so get more expensive? What use do we have of knowledge sharing meetings if we have to pay for them ourselves, yes, we get better and more efficient but do we get paid for it when we still just compete on how many hours we put on a project?

This is an aspect that one of the quality managers also touches upon and explains that he wants the organization to be better at bidding on fixed price contracts in the future because there is more to earn then. In the quote below one interviewee explained how this is thought to work.

Working on an open account I can never get more pay than 8 hours if I work 8 hours, a very effective way to earn more is to sell one piece of document. Let's say that we sell one document for 25 000 SEK instead of selling one report for 15 hours, then we can deliver more reports the faster we get.

Economy is what steers all work within the company and this has gotten an even greater focus since the Swedish consultancy was bought by CC group.

In the beginning of 2014 a new economy system will be introduced and one from management explains that this will help calculate which projects to bid on already from the beginning. Instead of the system today where a project is registered when it is contracted it will now be possible to register when starting to prepare an offer. This means that it will get easier for CC to make viable decisions. Another important function within this system is that it should be possible to search for resources to a project within the organization. Resources in this aspect are employees' knowledge and experience.

5.4.3 Culture

In most of the interviews culture was touched upon either directly or indirectly. It seems to be an open environment where employees are not afraid of asking colleagues about help and interviewees explain the importance of asking their way forward until they find the right person to ask. Mostly they are met by a friendly attitude, but some have experienced colleagues little willing to help due to personal characteristics. One puts it like this:

It is very personally tied, but eventually you find people that think in the same way as yourself, and then you continue to work with them.

Another mention the importance of having some understanding of what others work with in order to find the right person.

When asked about if feedback was something they gave or received interviewees felt that it was little of this in daily work but that they tried to say something positive when someone had done a good job. Most wished for more feedback on their work. One explained that he tried to give feedback to colleagues but that he had to check if they were ready to receive it, he also felt that people asked for feedback too seldom. Another felt that it could be hard to take if the feedback was personally directed and that he had learnt to not take all things personally since it can depend on the role he has.

The time and economy aspects above influence the culture and employees are stressed and feel a pull between projects. One mentioned the importance of communicating with colleagues and managers when it gets too much to do or preferably before it goes that far. Another aspect that becomes visible is that employees are free to engage in fields of interest and not because some manager said so. Together with managers' role of interpreting the company's goals this also means that some routines that is of importance might not be followed. For example each employee has a profile in the Intranet where all basic facts are listed but employees does also have the possibility to write something about themselves and what they are knowledgeable in. Today this is optional but when the new economy system comes it might benefit more people to actually fill in this field.

5.4.4 Motivation and Demand

When it comes to motivation it is clear that focus is highly tied to debiting time and economy and CC relies heavily on enthusiastic people that find time here and there to develop something good for the company. A year ago the company decided to make a change in the career system. From now on employees can choose to develop within four different lines of career: line management, project management, professionals and specialists, and business development. This is a change from before when the only career path were line management with more and more personnel management. This has been touched upon amongst interviewees and they feel that it is a good thing to be able to have a choice here.

Another aspect on the motivation factor is the process within the quality system that demands knowledge sharing reports in the end of a project. There are however no activity in the beginning of a project demanding employees to search for old reports. It is also unclear where these reports are stored since they can be stored within three different places, the project site, the departments site or somewhere in the O:drive.

From this we understand that it is difficult to motivate employees to create and spread information.

From the interviews demand was a factor that was seen to influence knowledge sharing work. Both demand from clients and from colleagues. Demand from clients was mostly connected to the economy aspect where consultants most often are procured on an open account and it doesn't feel like clients care that much to check consultants' work. It is accepted to "take the time it takes" is the feeling that consultants have. Demand from colleagues was more linked to asking for documentation and knowledge sharing reports. Although this is not a routine described in the project process in the quality system today the internal project seems to have made a conclusion that this is one step to improve knowledge sharing.

6 Discussion

In this chapter the findings will be discussed in relation to theory and also by looking at them from a holistic perspective, where factors that have been found will be discussed in relation to each other.

6.1 The term knowledge, the quality system and the Intranet

Looking at how the interviewees and respondents to the questionnaire defined knowledge, it is interesting to see how these definitions varied from some viewing knowledge as an asset while others putting more nuances into the term and a few giving a more complex definition similar to that of process and practice views. The quality managers tended to define knowledge as an asset, which is interesting since they work with development of the quality system and the Intranet that are CC's main ways to manage knowledge within the organization today. Viewing knowledge as a process or practice constructed through social interaction and negotiation of meaning (Kuhn & Jackson 2008) does however imply that these systems are limited when it comes to deliver full knowledge sharing (Newell et al. 2009). Meaning that it is only the explicit information, such as technical documents, framework agreements, tables, blue prints etc., which can be shared through these systems. From the findings it also becomes clear that even though the employees seem to think it is a good idea to save all documents in one place the general feeling is that it is difficult to find information within the systems and therefor it is much easier turning to a colleague in their near surroundings or even asking their way to a colleague in another division, through group-managers.

Another aspect on the sharing of information through these systems is the interpretation of them. Even though information in the quality system has gone through several formal processes to ensure reliability there are no guarantee that receivers interpret this in the same way as the sender meant for it to be understood (Wilson 2002). Hence, the managers thought of the quality system, as the single source of truths, seems impossible to fulfill and are more a dream of an ideal world than reality. What is though important to notice, is that these systems are well established and that they should work as supporting tools for employees' knowledge work (Alavi & Leidner 2001). Employees can use these tools in their work but they have to be aware of limitations for actual knowledge sharing and see it more like sharing of information.

The quality system has been developed by the company itself to describe processes and routines of how they should work in order to reach 'best practice'. One of the quality managers pointed out the difficulty of describing the whole organization and that due to this they had only focused on quality critical activities. From interviews with employees and the survey it has though been found that the system is not much used and that even though there are routines for how to share knowledge these are not followed. This gives evidence for the informal organization operating in its own ways to solve daily work problems (Schenkel et al. 2001). In the next sections factors that affect the daily work, when it comes to knowledge sharing, will be discussed.

6.2 Internal factors

Since knowledge is a term with many nuances and more complex than just information (Styhre 2003) it is interesting to view the organization from a community

of practice perspective (Johansson 2012). Reading on the intranet about professional networks seems to go hand in hand with this theory. Although while studying the activity within three of the networks, both internal and external factors that affect the function of the networks were found. In section 5.3 the findings showed that there are some internal factors that influence how well the network function. Looking back at Table 7, these were:

- o Creation
- o Purpose
- o Meetings
- o Key Word
- o Usage
- o Development

Looking at creation first, it is important to notice that for the network to succeed members needs to feel a part of the creating process. When employees are engaged in an early stage they get an understanding of why the network is important, how it should work, what each members role are, what they can contribute with and so on. This leads to the next factor that has been highlighted. Establishing a purpose, main goals and milestones is important for members in the network to work in the same direction and even for new members and people who needs to come in contact with a colleague within a special field of competence. What the networks and especially the network managers has to be aware of is that the purpose is not always fix, it might need changing over time depending on how the business environment changes. Studying the three networks, meetings were also an important factor. For something to happen in the network, for members to feel a part of it, and to increase activity members needs to coordinate, discuss learning from past projects, evaluate coming projects and future work areas. This implies that there needs to be some kind of meetings, and as the findings showed the network with one meeting a month were the network thought to best function. Key word to why members chose to be a member of the network was another internal factor that appeared. For a network to function it is important that the members have the right mindset and this they can get through the above mentioned internal factors. The fifth factor was usage, and here it was interesting to see that most members used the network to find the right colleagues to ask when faced with new problems. Which again give evidence for the excess storage of information. At last we have the development factor, which implies that it can be good for the network to have an insight into how it can improve and function even better in the future. This is again a process for developing new purpose, goals and milestones.

6.3 External factors

The above section has discussed factors within the network that needs to be in place for it to be well functioning and knowledge sharing. There have though been found some external factors as we saw in section 5.4. These were:

- o Time
- o Economy
- o Culture

- o Motivation and Demand

The external factors are grounded in the organization as a whole and its interaction with the world around. Time and economy are factors that are much steered by the market, its demand and supply. Another aspect is the way a consultant work and makes money. By selling their knowledge through performance in time, time and economy gets connected where the goal is to debit as much time of a workday as possible or at least 85 percent, which is the goal of the company. This goal set the framework for managers and group-managers and is a part of the creation of a culture focusing on the economy. Regarding knowledge sharing work, it is often hard to calculate the economic profit and this might be a reason to why managers do not demand and prioritize for knowledge sharing work to be done. This has also been mirrored in the employees where they tend to prioritize projects that they can debit the customer instead of spending time in networks. A choice that is not hard to understand when they are valued for reaching debiting percentage goals. The culture within the organization are today open where employees can ask each other for help, but with the factors discussed above this culture is exposed and vulnerable. As many studies have concluded before the human are not motivated only by economic goals. Focusing too much on this might remove the engineers' motivation to solve problems, work together, learn new things, and think innovative, all important for an healthy and successful organization.

7 Conclusions

Trying to grasp a holistic perspective of how a consultancy company share knowledge and how they can improve this has led to some conclusions but also some windows for further research. In the following sections the conclusions will be presented.

7.1 Creating a common understanding

From the discussion above concerning the term knowledge it is important for CC to, even though it is not easy, try to define what knowledge means to them. This is a step to define the task at hand. Defining what knowledge is and how it evolves will help in the process of trying to manage it. A key to define how knowledge evolves is to look at how people learn and what environment that encourages people to learn. In this thesis there has been no room for looking further into the field and to better understand how consultants can learn and interact with each other should be of interest to investigate more thorough. So far the company has focused much on its ICT systems but there needs to be a change of focus. The social interaction in the daily work needs to be acknowledged and studied further to see how the organization can improve and secure more efficient communication in order to increase knowledge sharing.

7.2 Creating the right context

The internal and external factors that affect knowledge sharing within the networks are in fact signs of the social structures within the company. These have a lot to do with the human mind and psychology. How we learn and how we get motivated to do a good job, improve, collaborate with our colleagues, strive for common goals of the organization and so on are some aspects where psychology plays an important role. Here it is important for management to create the right context and environment for their employees. Once again, even though the managers' jobs are to follow up on the economy it is important to include employees on a deeper level. If the employees go to their work feeling excited and encouraged, profit will come as a result. Further research should investigate performance within groups having different goals and structure in order to find the critical activities for a team to succeed.

CC has a large organization where different disciplines need to collaborate in order to solve complex problems. To overcome the knowledge boundaries between them, middle managers roles as knowledge brokers needs to be investigated further. Research should study how managers can act, how their social skills and network influence knowledge sharing between employees within different communities of practice.

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Overview of Networks within COWI Sweden

Titel	Service Cluster	Location	Members	Forum	Documents	Activity	Comments
Arbetsmiljögruppen	Economics; Management and Planning	Gothenburg, Malmö, Karlstad, Stenungsund,	8	1	0	2013-06-18	The Network has a clear worktask and meet two times a year. However no protocols from meetings have been documented. The question is if one person in each office is enough to secure a healthy work environment.
Avfall och resurshantering	Water and Environment; Industry and Energy	Sweden, Denmark and Norway	75 + NO	13	Many	2013-04-23	A network with members from different divisions. Seems like Sweden is the most active part. Doesn't mention anything about how the network works, meetings etc.?
Bas-P och Bas-U	All	Sweden	100	2	0	2013-05-15	Main goal of the network is to gather all employees with knowledge within BAS-p and BAS-U. However it is not that easy to find out which department members are working
Bioenergi - Styrmedel	Industry and Energy; Water and Economics; Buildings	Sweden	7	0	0	2012-12-17	Little activity. Lack of description.
Bioenergi Sverige	Industry and Energy	Sweden	24	0	Many	2013-06-25	A network that has a clear goal and lots of activity. Little information about members.
Byggadministration	All	Sweden	60	3	2 + empty folders	2013-07-03	A network with a good thought, but clear goals are lacking. They want to gather already existing networks into one place in order to make it more active.
CAD Elteknik	Buildings; Industry and Energy	Sweden	12	1	Some	2013-04-29	No description nor a goal.
COWI Akademien	All	Sweden	32	0	Many	2013-05-13	This is a network that delivers internal information to employees about education within the company.
COWI Sweden – professional network	All	Sweden	0	0	0	2011-10-28	Information about how networks work.
COWIportal editors - SE	All	Sweden	26	3	0	2012-05-09	The purpose is to show who are portal editors in Sweden but it is difficult to know which department members belong to and who to contact. It could be expanded to let all employees ask questions directly in the forum.
COWIportal SuperUser	All	Sweden	50	38	8	2013-05-15	Seems identic to COWI portal editors, just another name. This network has a lot of activity but still only members can post questions in the forum.
CSR tjänster	Water and Environment; Economics, Management and Planning	Sweden	1	0	Empty folders	2013-07-05	Only information.
Det goda kontoret	All	Sweden	16	6	0	2013-08-08	A good thought but there seems to be little activity. How does the group work to reach their goals?
El Besiktningsgrupp	Industry and Energy; Buildings	Sweden	20	3	12	2012-03-09	The network hasn't been active for a while.
Förorenade områden Stockholm	Water and Environment	-	-	-	-	-	Link is missing.
Fuktsäkerhet	Buildings; Industry and Energy	Sweden	1	1	0	2012-05-09	The network seems dead.
Geoteknik	All	Sweden	0	0	Pictures	2013-05-28	This network has a good purpose, but no members.
Hållbar inomhusmiljö	Buildings; Industry and Energy	Sweden	1	0	0	2012-05-09	This network seems dead.
Hållbara material och kemikalier	All	Sweden	17	1	2	2012-05-09	Good information about sustainable environment and why COWI work with this. Low network activity documented.
Hållbart samhällsbyggande	All	Sweden	49	1	Some+empty	2013-08-15	The description of the network gives general information but does not mention how the network works. However it seems that the group has had meetings earlier, but these have not been continued.

Titel	Service Cluster	Location	Members	Forum	Documents	Activity	Comments
Hållbart vatten	Water and Environment; Railways, Roads and Airports; Industry and	Sweden	2	0	0	2013-02-05	No activity and few members, but a good idea for a network. Development of work routines needed.
Hälsa, Säkerhet och Arbetsmiljö	All	Sweden	11	9	Some+empty folders	2013-02-21	No description, little activity
Hamnar och marin verksamhet	Bridge, Tunnels and Marine Structures	Sweden	28	4	Many	2013-04-03	No description, many documents, hard to find the right ones.
IT-samordnare - SE	All	Sweden	30	4	0	2013-06-14	Good purpose, but not so many documents and little activity.
Kalkylering	All	Sweden	17	0	7	2013-06-19	Good purpose but little activity so far. How is the network going to work in order to increase collaboration?
Kärnkraft	Industry and Energy	Sweden	71	2	0	2013-03-15	Poor description and little activity
KNX projektering	Industry and Energy; Buildings	Sweden	9	2	0	2012-12-12	Good intention, but no plan of how to proceed and therefore little activity.
Kontrollansvariga	All	-	-	-	-	-	Link not found
Kraftvärme energi	Industry and Energy	Sweden, China, Denmark	25	0	Empty folders	2013-02-22	Good purpose but no goals that can be followed up.
Kvalitets- och miljösamordnare	All	Sweden	30	0	Some	2013-05-30	Poor description, but network seems active since minutes of meetings are documented.
Marknad och kommunikation	All	Sweden	8	0	Event documents and photos	2013-08-20	Poor description, but the network seems active since documents and photos from events are posted.
Miljöcertifiering av byggnader och v	Buildings; Water and Environment; Industry and Energy	Sweden	23	1	Empty folders	2013-02-05	The network has an informative description and a list of members with their competencies. No work documented.
Miljöspecialister infrastruktur	Water and Environment	Sweden	11	3	Empty folders	2013-02-18	Good purpose and goal but little activity.
MKB	Water and Environment	Sweden	29	5	folders	2013-08-05	Good purpose and description. Members are described with skills.
Prefabricerade betongelement	Buildings	Sweden	39	8	Few+Empty folders	2013-05-22	Poor description and little activity.
Primavera COWI User group	All	Sweden	24	5	Some. Poor structure	2013-03-19	Poor description. No good organization
Revit Structure	Buildings	Sweden	29	6	Some	2013-08-27	Good thought but little description about how the network works.
Säkerhets klimat och säkerhetskultu	Water and Environment	Sweden	10	0	Empty folders	2013-08-20	Good description and goals. Many folders but they seem empty..
Skogsindustri	Industry and Energy	Sweden, Norway, China	10	0	Few+Empty folders	2013-03-12	Good purpose and description, but little activity.
SuperOffice CRM	All	Sweden	99	1	1	2013-02-15	Specific network directed at a large group. Little documentation.
Tekla Structures	Industry and Energy; Buildings	Sweden	79	23	Few+Empty folders	2013-08-21	Seems like an active network although the description is poor. Wonder where completed actions are stored.

Titel	Service Cluster	Location	Members	Forum	Documents	Activity	Comments
Tema Automation och Elteknik	Industry and Energy	Sweden	99	0	Some+Many Empty folders	2013-03-22	Poor description and little documentation.
Tema Beräkning	Industry and Energy	Sweden	14	0	1	2013-02-20	A clear description with an ambition for the network, but no description of how this is to be done. Little documentation.
Tema Bygg	Buildings	Sweden	99	4	Many	2013-08-27	A living and active network with people assigned to specific tasks.
Tema Föreningade områden Sverige	Water and Environment	Sweden	34	1	Some	2013-06-05	Good presentation of members. Some documentation but little activity like meetings.
Tema Infra	Bridge, Tunnels and Marine Structures; Major Bridges, Railways, Roads and	Sweden	1	0	0	2012-05-09	Dead network
Tema MRS	All	Sweden	1	0	5	2012-05-09	Dead network
Tema Process	Industry and Energy	Sweden	3	0	0	2012-11-20	Dead network
Tema Projektledning	All	Sweden	5	0	0	2012-05-09	Dead network
Tema Vatten Sverige	Water and Environment	Sweden	37	1	Few+Empty folders	2013-02-20	Good description and a defined purpose but little activity.
TK 64 Svensk Elstandard	Buildings	Sweden	21	5	Some+Empty folders	2013-04-16	Poor description of what the network actually does. Some activity but no clear structure.
Vindkraft Sverige	Industry and Energy	Sweden	18	1	Empty folders	2013-02-28	Good presentation of core members. Poor description and no activity documented.
Volvo Car Corporation (VCC) SE	All	Sweden	28	5	Some+Empty folders	2013-04-09	Good presentation of core members. Purpose of network is linked to economic factors. Good information on site about VCC.

Interview Questions

Start

1. Can you tell me a little about yourself?
 - a. How long have you worked at CC?
 - b. What do you work with?
 - c. How long have you worked with this?

Knowledge/Learning

2. What does knowledge mean to you?
3. How do you search for new knowledge?
 - a. Can you describe situations where your knowledge is not enough and how you do to solve the problem?
 - b. Is it a few people that you ask for help every time?
 - c. Do you reflect upon why you ask these specifically?
 - d. What kind of relation do you have?
4. Do you search for feedback?
 - a. If that is the case why/ or why not?
5. Do you share your knowledge with others?
 - a. Can you describe a situation where you have helped someone?
6. Do you give feedback?
 - a. Why/ why not?
7. Do you take time to reflect upon situations that where new to you?
 - a. What do you do with new insights?

Network

8. Can you describe the network?
9. Why are you a member in the network?
10. Have you met all members in the network?
11. How close do you work with network members?
12. Do you know what knowledge network members have?
13. How do you feel that the network is working?
14. Is it something you feel that can be developed in the way the network works?
15. Do you feel that you have learnt something new or that it is easy to develop new knowledge by membership in the network?

End

16. Is there something that you wish to add or clarify?

Interview Questions for Management

Start

1. Can you tell me a little about yourself?
 - a. How long have you worked at CC?
 - b. What do you work with?
 - c. How long have you worked with this?

Knowledge/ Learning

2. What does knowledge mean to you?
3. How do you search for new knowledge?
4. How does CC define knowledge?
5. How does knowledge sharing happen?

Network

6. What is the purpose with the networks at CC?
7. What guidelines have you got from Denmark that you need to follow regarding the networks?
8. How do you think the networks function?
9. What does CC get out of the networks?
10. What do you want to get?
11. What do employees get from networking?
12. Do you do something special to encourage personnel to network with others?
13. What do you think are required for the networks to be more used?
14. How can networks develop?

End

15. Is there something that you wish to add or clarify?

Enkätundersökning

Frågor om COWI's professionella nätverk.

Syftet med enkätundersökningen är att söka svar på hur medlemmar av de studerade nätverken upplever att de fungerar och vad de tycker kan utvecklas.

Inledning

- Kvinna/man
- Ålder
- År på COWI
- Yrkesområde/titel

Kunskap

- Hur ofta behöver du leta efter information genom:
 1. Internet
 2. Intranätet
 3. IMPROVE
 4. Kollegor
 5. Andra kontakter
 6. Annat
- Hur snabbt tycker du att du hittar den informationen du behöver för att lösa ett problem?
 1. Internet
 2. Intranätet
 3. IMPROVE
 4. Kollegor
 5. Andra kontakter
 6. Annat
- Hur bra upplever du att det går att tolka den informationen du får genom de olika källorna?
 1. Internet
 2. Intranätet
 3. IMPROVE
 4. Kollegor
 5. Andra kontakter
 6. Annat

Nätverk

Nedan följer frågor som rör COWI's professional networks. Där det efterfrågas information om ett nätverk är det tänkt att du ska svara för det nätverket som är uttaget i studien (Bioenergi, Kalkylering eller Tema Föreordade Områden)

- Hur många professional networks är du medlem i?
- När blev du medlem i nätverket?
- Får du information och nyheter från nätverket?
- Hur ofta är du inne på nätverkets hemsida?
 1. Dagligen
 2. Veckovis
 3. Några gånger i månaden
 4. Någon gång per år
 5. Aldrig
- Hur många medlemmar är det i nätverket?
- Hur många av nätverkets medlemmar:
 1. Känner du väl?
 2. Vet du vem är?
 3. Känner du inte alls?
- Har du träffat alla i nätverket?
- Har nätverket kontinuerliga möten?
- Hur tycker du att nätverkets hemsida fungerar?
 1. Dokument
 2. Forum
 3. Startside
 4. Annat
- Underlättar nätverket ditt arbete när det gäller att hitta rätt information inför nya problem?
- Läger du upp information på nätverkets hemsida?