Delft Cluster

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Acknowledgement
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Other Research project sponsor(s):

TU Delft Delft University of Technology | Telematica Instituut

Abstract

Delft Cluster –an alliance of several potentially competing organisations– has the goal to become an internationally renowned knowledge center in the area of sustainable river delta development. In order for knowledge to flow among the various organisations –and in particular between knowledge institutes and sector organisations– ICT tools can be used. However, in our research we have sought to improve our understanding of 'the ways of working' of engineers and researchers in DC first. Only after a clear insight into their motivations for knowledge sharing and development, we could say something about the type of organisational and technological support they might need.

Our goal in the report is threefold:

- To get insight in the nature and dynamics of distributed knowledge sharing in Delft Cluster, and
- To differentiate technological, organisational and social conditions that facilitate and/or hinder knowledge sharing in Delft Cluster.
- To develop guidelines for the design and maintenance of technological and organisational support.

And in particular, we provide answers to the following research questions:

- *How do people in the specific context of DC share and develop knowledge together in communities? And,*
- *How does their co-operation develop?*

Considering its goal mentioned, the report has the following **structure**: In **chapter one** we describe many insights from literature study. It incorporates insights on the context of *alliances* (why do organisations, even if they are competitors, co-operate in alliances? How do they learn in alliances?) and *communities* (what types of groups and communities can be distinguished? How do these communities develop?). We also discuss *conditions* that can be found in literature for the effectiveness and success of groups. **Chapter two** presents our method used in this DC study. And **chapter three** presents the results of this study. It includes *specific lessons learnt* in three communities in DC, some *general lessons learnt* and *guidelines* that could be abstracted from them. This chapter tries to answer the research questions mentioned above. In **chapter four**, the main conclusions and guidelines are summarised.

PROJECT NAME:	**Knowledge Sharing in DC CoPs**	PROJECT CODE:	**07.03.02**
BASEPROJECT NAME:	**Community of Practice**	BASEPROJECT CODE:	**07.03**
THEME NAME:	**Knowledge Management**	THEME CODE:	**07**

Executive Summary

Introduction

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- *How do people in the specific context of DC share and develop knowledge together in communities? And,*
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In general, the report is mainly a descriptive overview of research activities that have been performed spread out through a total of 18 months. However, at the end we also provide several guidelines for supporting communities of practice (CoPs) –based on the insights from this research, that could be useful for the various DC participants, and for DC as a whole in particular.

Approach

The report presents insights from both literature and a DC case study. This end report incorporates our previous report for the project 07.03.02 'Knowledge Sharing in DC Communities of Practice' (Andriessen et al., 2001). In general, after an orienting phase, we have selected and studied three CoPs in DC. A CoP is *a long-term oriented group whose purpose is to exchange, acquire and create knowledge around a certain practice, i.e. a skill, topic, or professional discipline. The group consists of individuals who are usually geographically distributed, either intra- or inter-organisational, but with a shared identity.* In each of the CoPs, respectively Theme 6, Coastal Researchers and NHP, we have mainly used documents and in depth interviews, and some additional material. In total we have held around 35 interviews. And we have performed a survey in two of the three selected groups.

Results

It appeared that in DC no 'official', formalised, strategic CoPs that consisted of people from all of the (and only these) DC organisations, existed. Most of the groups in DC are project groups or other types of task teams. Therefore, it took us a long time before finding the types of groups that met the above CoP definition, that we could study in-depth. Once found, the three CoPs studied provided us several lessons and insights.

DC as a whole has several specific characteristics. DC can be considered as a regional cluster in which

(potentially) competing organisations co-operate. Often this involves a co-operation between knowledge institutes and sector parties. Many people from the organisations in DC therefore have professional experiences as knowledge workers. These characteristics and some general lessons learnt in this study are discussed in this report. The particular characeristics of the CoPs are presented in table 6 and as part of chapter three. In general, DC has met two challenges in co-operation. (Potential) competitors need to co-operate with each other and knowledge institutes need to work with sector organisations. Each encorporate certain tensions. The co-operation in a CoP as a whole develops along several stages, each with its own particular activities.

In order to be effective, CoPs in DC showed several conditions that seemed to be important. For instance, organisational support is required to have a positive enabling environment and resources for co-operation and knowledge sharing in particular. The size of an organisation determines to a certain extent how dependent it is on other organisations and their knowledge. Further, overlap proved helpful in those areas that enhanced a mutual understanding (such as a shared language or background). On the other hand, parties need to be able to add value to the other(s), in order to be 'attractive' in the first place. A mutual goal to share knowledge in a CoP can be stimulated if it is required by the government or complexity of the specific area for example. Then organisations need each other.

Within a CoP, composition should receive careful attention. People need to be able to understand each other, and they also need to complement each other. Co-operation further needs to be made concrete, and we present several ways how this can be done. In some cases it proved very useful to make several formal agreements, regarding roles, responsibilities etc. Finally, personal characteristics, such as trust, passion, comparability as peers and reputation appeared important.

Specific guidelines could be abstracted from these conditions and other insights, and are presented in chapter four. These include, but are not restricted to the following:

- *Try to find or stimulate an active core of preferably extremely enthusiastic and (instrinsically) motivated people, that can serve as an important driver for the community.*
- *At alliance, organisational and community level, management needs to create and provide a positive enabling environment for knowledge exchange and creation (both 'soft' and 'hard' factors). Thus, provide a good co-ordinator as well as time, for instance.*
- *Agreements beforehand on a clear goal and how responsibilities and roles are divided are important, but they should not be made too 'tight' (impossible to live after),*
- *Find and in particular, formulate a concrete and clear practice.*
- *Create overlapping memberships and networks, while using a co-ordinating platform to collect, transfer, use and co-ordinate knowledge in a particular practice.*

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General Appendix: Delft Cluster Research Programme Information

This publication is a result of the Delft Cluster research-program 1999-2002 (ICES-KIS-II), that consists of 7 research themes:
►Soil and structures, ►Risks due to flooding, ►Coast and river , ►Urban infrastructure, ►Subsurface management, ►Integrated water resources management, ►Knowledge management.

This publication is part of:

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Baseproject name	:	Communities of Practice		
Project name	:	Knowledge Sharing in DC CoPs		
Projectleader/Institute		Drs. M. Soekijad		TU Delft
Project number	:	07.03.02		
Projectduration	:	1-11-2000	-	31-4-2002
Financial sponsor(s)	:	Delft Cluster		
		TU Delft		
		Telematica Instituut		
Projectparticipants	:	Delft Cluster		
		TU Delft		
Total Project-budget	:	Fl. 355.019,-		
Number of involved PhD-students	:	2 (3 initially)		
Number of involved PostDocs	:	0		

Delft Cluster is an open knowledge network of five Delft-based institutes for long-term fundamental strategic research focussed on the sustainable development of densely populated delta areas.

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3 E. Andriessen	
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Other Involved personnel

The realisation of this report involved:

Name	**Organisation**
1	
2	
3	

Delft Cluster

07.03.02: Knowledge sharing in Delft Cluster Communities of Practice

Final report on Knowledge Sharing in Delft Cluster Communities of Practice

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TU Delft
Delft University of Technology

Contents

Preface

Delft Cluster (DC) is an alliance of five knowledge institutes in Delft that focuses on research into prospects for sustainable development of densely populated delta areas. DC aims to become a global centre of expertise and knowledge for fundamental, strategic long-term research that focuses on sustainable infrastructures of densely populated river-delta areas. To achieve this goal, DC needs to be focussed on the management of knowledge, in particular knowledge sharing and creation. In order to manage knowledge, a good insight in the 'ways of (knowledge) working' of engineers and their organisations in DC is necessary.

When it comes to 'management of knowledge', large organisations often seek their solutions in tools in which knowledge can be stored and found. This is however a rather one-sided perspective on how knowledge can be managed. Instead of this 'encoded' view, based on the premise that all knowledge can be made explicit, another perspective can be used as well (Hansen, Nohria & Tierney, 1999). This second, personalised view is based on the idea that much knowledge is tacit and cannot easily be 'codified' and stored in a tool. From a personalised view, communities of practice can be considered.

A 'Community of Practice' (CoP) is a long-term oriented group whose purpose is to exchange, acquire and create knowledge around a certain practice, i.e. a skill, topic, or professional discipline. The group consists of individuals who are usually geographically distributed, either intra- or inter-organisational, but with a shared identity.

Instead of designing or recommending a tool for DC knowledge management, we have sought to provide insight into the ways of working of engineers and academics in DC. We will take a look at their motivations for co-operation, for instance. Are they interested in sharing? To what extent are they willing to share their knowledge with people from other, sometimes even competing organisations? Why will they share or even develop new knowledge together? And then, if we understand more about their ways of working and motivations, we might be able to provide further insight on the type of tools that they can use.

This is the final report of the research project *'Knowledge sharing in Delft Cluster Communities of Practice'*, 07.03.02. The **objectives** of this project, and therefore this final report, are the following:

- To get insight in the nature and dynamics of distributed knowledge sharing in Delft Cluster, and
- To differentiate technological, organisational and social conditions that facilitate and/or hinder knowledge sharing in Delft Cluster.
- To develop guidelines for the design and maintenance of technological and organisational support.

The first goal can be further specified into our **research questions**, which we will answer in this report:

- *How do people in the specific context of DC, share and develop knowledge together in communities? And,*
- *How does their co-operation develop?*

These questions refer to the particular context of DC as an alliance in which people from (potential) competing organisations co-operate in CoPs.

We have, to a large extent, integrated our former (first) report of this project (Andriessen, Soekijad, Huis in 't Veld & Poot, 2001) in this final report *'Final report on knowledge sharing communities in Delft Cluster'*.

Considering its goal mentioned, the report has the following **structure**: In **chapter one** we describe many insights from literature study. It incorporates insights on the context of *alliances* (why do organisations, even if they are competitors, co-operate in alliances? How do they learn in alliances?) and *communities* (what types of groups and communities can be distinguished? How do these communities develop?). We also discuss *conditions* that can be found in literature for the effectiveness and success of groups. **Chapter two** presents our method used in this DC study. And **chapter three** presents the results of this study. It includes *specific lessons learnt* in three communities in DC, some *general lessons learnt* and *guidelines* that could be abstracted from them. This chapter tries to answer the research questions mentioned above. In **chapter four**, the main conclusions and guidelines are summarised.

As a **reader-guide**, we advise fast-readers with limited time and interest to read at least the management summary and chapter 4 (conclusions and guidelines). For those who are interested to see how these conclusions were developed, we recommend readers to look into chapter three as well. Chapter one and two are particularly interesting for those readers who would like to go in-depth into literature and research design. Further, we would like to mention that the results of questionnaires posed in NCK and Theme 6 are added in Appendix F. As additional research output, we have included a scientific paper based on this study in Delft Cluster in Appendix G.

The research performed in this project incorporates two PhD research-projects at the TPM faculty of Delft University of Technology, at the section of work and organisation psychology. The first project has the goal to deliver a method for evaluation of ICT tools that are particularly designed for supporting knowledge processes in groups. The second is research into how knowledge is shared among people who come from different (competing) organisations.

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- *Create overlapping memberships and networks, while using a co-ordinating platform to collect, transfer, use and co-ordinate knowledge in a particular practice.*

[1] We refer to DC as a network in which (potential) competitors co-operate. However, as this research shows, this will be 'weakened' in the sense that not many participants and respondents actually 'feel' this to be the case. In theory therefore the organisations might meet each other as competitors, in particular when they 'strive' for the same (governmental) funding for projects etc., but in practice, people don't feel to be in each other's way (as is shown in sections 1.1.2 and 3.4.1, for instance).

1. Background and literature study

"a new logic of organising is developing. ... [T]he core capabilities of organisations are based increasingly on knowledge seeking and knowledge-creation. In technologically intensive fields, where there are large gains from innovation and steep losses from obsolescence, competition is best regarded as a learning race. The ability to learn about new opportunities requires participation in them, thus a wide range of inter-organisational linkages is critical to knowledge diffusion, learning and technology development"

(Powell, 1998: 228).

New business models in the area of (virtual) network organisations are all highly dependent on interaction and collaboration between geographically distributed individuals and groups. Groups such as communities of practice will form essential elements in organisational innovation. Their functioning is the glue that keeps network organisations or alliances, such as DC, together. And, more important, they are the places where essential knowledge is exchanged and new knowledge is created. In contemporary organisations knowledge has become an important resource to improve the organisation's competitive advantage. Successful exchange of knowledge in alliances however often requires technological support.

This chapter is an introduction into the field of interest, i.e. knowledge sharing in communities. The chapter includes the result of literature study on learning in alliances, on communities in general, and also on conditions (social, organisational and technological) for supporting communities more in particular. First, we will explain why organisations increasingly tend to co-operate in alliances, and how they learn in alliances. This section describes the context of knowledge sharing in CoPs. Then we will discuss the various types of groups and communities that can be distinguished, and how they develop through time. And we will discuss what type of conditions can be found for the successful or effective functioning of communities. Concepts presented in this literature study will be used throughout the rest of the report.

1.1 Learning in alliances[2]

One of the most important reasons for organisations to participate in alliances[3] is that they can learn from each other. This will subsequently increase their competitive advantage. How organisations learn exactly in alliances is explained in this section.

1.1.1 Alliances and learning

Many insights have been developed on learning and knowledge processes within alliances (e.g., Inkpen & Dinur, 1998). Organisations can learn from other organisations how to

[2] Adapted from Soekijad, M. (2002)- The competitive factor in knowledge sharing networks, in: *Proceedings of OKLC2002 conference, Athens, Greece, (CD ROM).*

[3] An alliance is a network on which two or more organisations have formally agreed to co-operate in, to achieve a shared goal.

improve their operations, strategy, competencies or capabilities (Huber, 1991). Mowery, Oxley and Silverman (1996) add that organisations can learn *"new technical skills or technological capabilities from partner firms"* in alliances. These are often *"based on tacit knowledge and are subject to considerable uncertainty concerning their characteristics and performance"* (p. 79). Inkpen and Dinur (1998) provide examples of the types of knowledge organisations can transfer, such as knowledge on how to manage product development cycles, or knowledge in the areas of manufacturing process and human resource management.

Others have specifically focused on learning capabilities of the alliances themselves (Lane & Lubatkin, 1998; Kraatz, 1998). Some of these authors feel they can no longer look primarily at knowledge transfer in a single organisation, but need to focus on interorganisational knowledge transfer and learning, by adopting a boundary-bridging perspective (Levinson & Asahi, 1995). Khanna, Gulati and Nohria (1998) specifically refer to common benefits as those benefits that each organisation in an alliance can 'earn' *"from the collective application of the learning that both firms go through as a consequence of being part of the alliance"* (p. 195).

Finally, learning about alliances and how to collaborate as a means for improving competitive advantage of an organisation is also discussed in literature (Gulati, Nohria & Zaheer, 2000). Powell (1998) for instance states that (successful) participation in, and management of alliances are *"key drivers of a new logic of organising"* (p. 231). Thus, organisations might want to acquire knowledge that can be used for the management of alliances in general. This can also help them in the design of new future alliances (Lyles, 1988).

In sum, much research on knowledge processes and learning in alliances has focused on organisational and interorganisational learning, especially from a strategic perspective. Organisations can learn IN alliances, together they can learn AS alliance, or they can learn ABOUT alliances. However, this does not sufficiently explain *how* people and organisations (successfully) learn in alliances. It merely focuses on *what* can be learned in alliances. Neither it explains how tacit knowledge is shared at the interpersonal level. It is said that precisely this tacit knowledge is often hard to transfer from the individual to the organisational level (Inkpen & Dinur, 1998; Inkpen & Crossan, 1995). Further, the organisations in the alliance are competitors and might therefore also meet specific challenges in knowledge transferring. One such challenge will be discussed in the following section.

1.1.2 Interorganisational learning dilemma

In DC, a number of (potential) competitors co-operate in an alliance. Organisations in DC might therefore follow a *'co-opetitive'* strategy by simultaneously combining competition and co-operation with other organisations in the alliance (Brandenburger & Nalebuff, 1996). In a situation of co-opetition, organisations can meet an *'interorganisational learning dilemma'* (Larsson, Bengtsson, Henriksson & Sparks, 1998). This dilemma, based on game theory literature (e.g., Axelrod, 1984), specifically focuses on learning between organisations. On the one hand co-operation is found necessary in order to learn from each other and reach synergy by exchange and development of both explicit and tacit knowledge. Here, knowledge equals *strength*. On the other hand however, parties may feel the urge to 'exploit' the other parties involved by maximisation of their organisational benefits of co-operation, which means: 'take but not give'. Thus, an organisation is not willing to share its own knowledge because it is considered of great strategic importance and value. This latter behaviour will frustrate the

mutual learning and will probably even destroy the alliance or co-operation. In this case, knowledge is considered as *power*.

1.1.3 Knowledge sharing communities in co-opetitive alliances

As said, learning is an important reason for organisations to participate in alliances. Because individuals are the actual knowledge workers, the settings where knowledge processes take place are interpersonal groups such as (multidisciplinary) project teams, job-groups, networks of expertise, or communities of practice. Here, people from the different organisations meet each other. Especially in those interpersonal settings that have knowledge exchange and development as their main goal and activities, such as CoPs, people tend to learn the essentials of their (daily) work by participating in them, or develop new knowledge in their practice. Here, particularly tacit knowledge is likely to be transferred or developed.

Although organisations in alliances can meet a learning dilemma, individuals in interpersonal settings sometimes prove to be able to overcome organisational competition. Von Hippel (1987) for example, studied competing organisations where people in informal groups appeared to trade their know-how among each other. These informal trading groups develop between engineers from different competing organisations who have a professional interest in common. These are interpersonal groups that can be considered as knowledge sharing communities. His study argues that these informal groups have their own dynamics, which in a sense seem to be 'stronger' than the rivalry among the organisations. Individuals in these informal groups tend to exchange and develop knowledge more easily, even though their organisations are highly competitive. Especially if the other individual (to whom knowledge is traded) is considered a *"useful and appropriately knowledgeable expert who may be of future value to (the seller)"* (p. 5).

Another insight from literature on learning in co-opetitive alliances comes from Bengtsson and Kock (2000). Their article suggests that individuals in alliances might find it hard to simultaneously co-operate and compete with another person. Therefore, they propose that individuals and groups should specialise in either competition *or* co-operation with a particular relation. Although their study does not specifically focus on learning, their results might imply that at the interpersonal level a learning dilemma is less obvious than it is at the interorganisational level. Therefore, it is necessary to look specifically at this interpersonal level when trying to find conditions for (successful) knowledge sharing and development in alliances.

In sum, organisations try to improve their competitive advantage and innovative ability by learning in alliances. Because here they co-operate with competitive organisations, they can meet a learning dilemma at the interorganisational level. However, as much actual co-operation and learning takes place at the interpersonal level, in CoPs, learning might have its own dynamics. In the next section we will discuss the main issue of the research, i.e. the concept of communities, in more detail.

1.2 Communities[4]

As said, at the interpersonal level, CoPs for instance are important settings for actual learning in alliances. Communities are different from teams or task groups in that they explicitly focus on learning. How communities further differ from other types of groups, what communities are and how they develop will be discussed in this section.

1.2.1 Communities versus other groups

Central in the concept of communities are the 'practices', around which communities build, acquire and create their knowledge. This is not theoretical knowledge, but knowledge related to a common practice such as a professional discipline, a skill or a topic (McDermott, 1999a: 3). Sharing knowledge in a community will build or enrich a (set of) common practice(s). A community builds capability in its practice by developing a shared repertoire and resources such as tools, documents, routines, vocabulary, stories, symbols, artefacts, heroes, etc., that embody the accumulated knowledge of the community. This shared repertoire serves as a foundation for future learning (Allee, 2000). However, around this common theme, various types of communities can be identified. In this section we first present literature concerning the difference between communities and other groups, such as teams and functional units. Then, various forms of communities as discussed in the literature will be described and compared.

In their work Lave and Wenger (1991) describe a CoP *"as an intrinsic condition for the existence of knowledge"*. Botkin (1999: 241) defines CoPs as *"highly informal groups of people that develop a shared way of working together to accomplish some activity. Usually such communities include people with varying roles and experience. (...) They are also the place where people tend to learn the essentials of their jobs"*. According to Manville and Foote (1996) a CoP is *"a group of professionals informally bound to one another through exposure to a common class of problems, common pursuit of solutions, and thereby themselves embodying a store of knowledge*". Brown and Solomon Gray (1998) add that the community is small and the professionals have worked together over a period of time.

Communities are different from a team, a task force, and an authorised or identified group. *"They are peers in the execution of 'real work'. What holds them together is a common sense of purposes and a real need to know what each other knows"* (Brown & Solomon Gray, 1998). Some refer to this latter as shared expertise and passion for a joint enterprise. Tessun (2000) simply states that *"a CoP is a group of experts who meet on a regular base related to a specific topic"*. He distinguishes CoPs from other types of groupings, referring to the classification of Wenger and Snyder (2000), as shown in table 1.

	CoPs	**Functional Units (formal work group)**	**Project Teams**	**Informal Networks**
Purpose	Develop capability	Produce an output	Accomplish a specific task	Disseminate information
Boundary	Knowledge domain	Market, product or function	Assigned charter	Scope of relationships
Connection	Identity	Reporting	Commitment to	Interpersonal

[4] Adapted from Andriessen, J. H. E., Soekijad, M., Huis in 't Veld, M. A. A. & J. J. Poot (2001)- *Knowledge sharing communities in Delft Cluster. Report Delft Cluster case study*. Delft University of Technology: Delft

		relationships	goal	acquaintance
Time Scale	Enduring	Enduring	Temporary	Variable

Table 1. Comparison of various groups (Wenger & Snyder, 2000)

McDermott (1999b) also identifies several characteristics of CoPs, in comparison to those of teams (see table 2)

Teams	CoPs
Driven by deliverables	**Driven by value**
Shared goals and results	Shared interest or practice
Value defined by charter	Value discovered / evolves
Value in result delivered	Value in ongoing process
Defined by task	**Defined by knowledge**
Interdependent tasks	Interdependent knowledge
Clear boundaries	Permeable boundaries
Develops through a workplan	**Develops organically**
Everyone contributes	Variable contributions
Managed through objectives and workplan	Managed by making connections

Table 2. Teams and CoPs; a comparison (McDermott, 1999b)

McDermott states: *"Teams are tightly integrated units driven by deliverables, defined by managed tasks, and bound together by members' collective commitment to results. Communities of practice are loosely knit groups driven by the value they provide to members, defined by the opportunities to learn and share what they discover and bounded by the sense of collective identity the members form."* Communities are driven by the value they provide to individual members while a team delivers value in the result it produces. The next thing is that the set of interdependent tasks that leads to an objective forms the heart of a team, while in the community the heart is formed by the shared knowledge. McDermott further states that teams progress by moving through a workplan, while communities develop by discovering new areas to share current knowledge and develop new knowledge. That is why managing these two groups is a very different job. Managing a team consists of co-ordinating interdependent tasks. Managing a community is making connections between members and keeping the topics of the community fresh and valuable.

Thus, CoPs differ from teams on various items, e.g., purpose or goal, boundary, connection, time scale, drive and development. The definitions and descriptions of CoPs all have some *common* elements – knowledge sharing in a specific domain – but also refer to *different* elements: the one refers to professionals, the other to experts, a third to regular meetings, a fourth to the fact that communities are informal. The discussion is complicated by the fact that different names can be found for concepts or constellations, which are sometimes similar to CoPs, such as virtual communities, knowledge communities, and occupational communities. Instead of focussing on the various names themselves, in this document we will focus on the characteristics along which communities can diverge. Consequently we will use the term (knowledge sharing) communities or CoPs, without preference for a particular type.

Communities can vary along dimensions such as intraorganisational - interorganisational, closed boundaries - permeable boundaries, high virtuality - low virtuality, high 'groupness' (connectivity) - low 'groupness' (connectivity), high formality – low formality and high

community identity – low community identity. And communities can differ in their purpose, size, practice, intensity of interaction and visibility. Another important distinction in communities is their nature. Some communities (Orr, 1990; Barley, 1986; Lave and Wenger, 1991) can be described as: *"the informal and often invisible communities that every company has"* (Botkin, 1999: 30). These are often spontaneously originated groups without a specific strategic goal. Other communities are "*purposely formed - some like those at AT&T even have formal membership lists - and their purpose is to shape future circumstances. They are highly visible to every businessperson in the organisation"*. In contrast to the first type of communities, that can mainly be seen by social researchers, this latter type of communities are often 'installed', or at least stimulated or facilitated by the organisation (e.g., in Unilever, BP Amoco, Shell). These type of communities are often considered as 'instruments' in knowledge management activities.

In conclusion, considering all of the different names used and various characteristics on which communities can differ, we define a community as follows: *A Community of Practice is a long-term oriented group whose purpose is to exchange, acquire and create knowledge around a certain practice, i.e. a skill, topic, or professional discipline. The group consists of individuals who are usually geographically distributed, either intra- or inter-organisational, but with a shared identity.* Thus, we consider a group a community when it has the charactertics mentioned. Now that we have explained what communities are and what variations among communities can be found, the following section will discuss some ideas from *team* literature. Much research that has been done into the dynamics and effectiveness of teams might be helpful in discussing and understanding communities.

1.2.2 Lifecycle: developmental stages of groups

When people start working together it takes some time before they are welded into a smoothly running 'team'. Researchers have distinguished 'developmental stages' in this process, without claiming that these stages always follow a neat sequence. A well-known stage model is that of Tuckman, who distinguished five stages, often refered to as forming, storming, norming, performing, and adjourning (Tuckman, 1965; Tuckman & Jensen, 1977). Discussing task teams, McGrath (1990) prefers to speak of 'modes' instead of stages, since groups do not always follow the expected stages sequentially. According to his view each group has to deal with certain developmental issues, which he calls orientation, means choice, conflict solution and execution (see the parallel with Tuckmans model). According to McGrath 'healthy team development' requires the group to undergo all four modes in its own sequence. Another life cycle model –especially for communities- is presented in the work of Wenger (1998). He distinguishes five stages, i.e. potential, coalescing, active, dispersed and memorable. Here too, parallels can be seen with the Tuckman model.

Combining these models we then have a model of developmental stages that we can use throughout the remaining part of the report. In the following table (Table 3) the major processes and characteristics are presented per stage.

Stage	Major Processes	Characteristics
1. Orientation	Exchange of information; increased interdependency; task exploration; identification of commonalities	Tentative interactions; polite discourse; concern over ambiguity; self-discourse
2. Conflict	Disagreement over procedures; expression of dissatisfaction;	Criticism of ideas; poor attendance; hostility; polarisation

	emotional responding; resistance	and coalition formation
3. Conflict solution	Growth of cohesiveness and unity; establishment of roles, standards, and relationships	Agreement on procedures; reduction in role ambiguity; increased 'we-feeling'
4. Active performance	Goal achievement; high task orientation; emphasis on performance and production	Decision making; problem solving; mutual co-operation
5. Dissolution	Termination of roles; completions of tasks; reduction of dependency	Disintegration and withdrawal; increased independent and emotionality; regret

Table 3. Five stages of group development (adapted from Tuckman)

So, we now know that many competing organisations co-operate in aliances to increase their knowledge. We also know what a community is, and how it can develop along several stages. In order to be able to answer the research questions in this report however, we also need to know when communities can be considered 'successful'. Therefore, in the next section, we will present conditions from literature that facilitate or hinder knowledge sharing activities.

1.3 Conditions for effective or successful groups

What are the organisational and technical conditions for the successful functioning of communities? The answer depends on what one considers as success. It is obvious that criteria for success will differ from one organisation to another. However, success of groups can always be defined in terms of the three types of functions all group have, although in varying combinations (e.g., McGrath, 1984):

- The *production* (organisational) function: a group is successful to the extent that it contributes, through its output, to the effectiveness and innovation of the organisational context.
- The *group wellbeing* function: a group is successful to the extent that its activities contribute to its own attractiveness and continuation;
- The *member support* function: a group is successful to the extent that membership is rewarding for the individual group members. Individual members are only motivated to co-operate in a group if they can find attractive personal outcomes such as finding new information, being able to do one's work better or feeling a sense of belonging to the group.

Success, in terms of individual learning, group vitality and/or producing organisationally relevant products, is a function of many conditions. According to certain team effectiveness models (e.g., Hackman, 1987; Andriessen, 2002), the success of groups depends firstly on the characteristics of the setting, i.e. characteristics of the task, individuals, group structure (e.g., formal rules), group culture (e.g., trust), the (ICT-) tools and the environment, and secondly on the processes of interaction e.g., on the way they communicate, co-ordinate and learn. These characteristics and processes however are not static but can change continually, particularly in the early ('life-cycle') stages of group existence. In this dynamic perspective context characteristics such as the group task or trust are both conditions for *and* output of group processes, depending on the moment of observation.

More precisely, the success of a group depends on the degree to which the processes mutually match, and the degree to which the input characteristics match. This means for instance that

the level of formality of the community should fit the goals of the group. Since the goals can vary widely they may be difficult to reconcile: continuity of the group is probably served by strong formalisation and institutionalisation, while spontaneous knowledge sharing may be better served by weak formalisation. In the same way certain processes may be inherently incompatible: strong co-ordination may be difficult to match with knowledge creation and learning processes. Although these insights in particular apply to teams, we propose that they can also be applied for communities, at least to a certain extent.

In the next two sections we will discuss two types of conditions in particular: trust and those in relation to ICT support.

1.3.1 Trust

Trust is seen as an important factor that influences the sharing and creation of knowledge (Parkhe, 1993; Larsson et. al., 1998). Trust can be enhanced by three factors. First, the idea of a 'shadow of the future' (Axelrod, 1984) implies that, if the participants involved have the perception of a shared future, it is more likely that they will evolve towards a co-operative strategy (in order to avoid retaliation for example). Second, experiences from the past with a certain partner or with networks or structures alike, tend to 'colour' the strategy or perception of the other party, the situation, or the payoff (see also Gulati, Nohria & Zaheer, 2000). As Inkpen and Dinur (1998) state: *"Organisations can use their alliance experience as the basis for managing and creating knowledge"* (p. 466). And third, the process itself tends to influence the actions and strategies as well.

Four types of trust can be distinguished (following Klein Woolthuis, 1999): *Initial trust* is a basic 'presence' of trust (some people just have a high initial trust: they tend to trust easily). Second, *cognitive trust* implies the amount of trust that a person has formed by knowledge of the other. This can be from stories told by a third party or from reading about the other. *Habituated trust* is developed by the experiences with the other. And *affective trust* is the trust that is instantly there (or not) at first contact: it can be compared with 'chemistry'. Especially the latter type of trust has proven to be of highly importance for the continuity of co-operation processes.

1.3.2 ICT for communities[5]

ICT for groups

ICT applications that can support groups are often referred to as 'Groupware'. Groupware refers to software products that support groups of people engaged in a common task or goal. Conditions that emerged in workplaces to encourage structured research in this area included (a) computation technology inexpensive enough to be available to all members of some groups: (b) a technological infrastructure supporting communication and co-ordination, notably networks and associated software; (c) a widening familiarity with computers, yielding groups willing to try the software; (d) maturing single-user application domains that pushed developers to seek new ways to enhance and differentiate products (Grudin, 1994). But these developments also brought 'problems' or challenges.

[5] Adapted from Huis in 't Veld, M. A. A., Andriessen, J. H. E. & M. Soekijad (2002)- ICT facilitiation of distributed groups and communities (Ch4), in: Verbraeck, A & A. Dahanayake (eds.) (2002)- *Building blocks for Effective Telematics Application Development and Evaluation, TUDelft-Betade*, pp. 39-46, Delft

Groupware has been developed to support groups, but there are many different types of groups. When to use what, and why are some applications in one situation successful and in another not? Three issues are important to consider when facilitating CoPs. Firstly, fitting the tool to a certain group is very important, but not as simple as it appears at first sight. Secondly, the way a tool is introduced is at least as important for success as the tool itself. And finally, after the introduction of a tool, a group more or less appropriates the tool, i.e. both the group(activities) and the tool are adjusted to each other. This issue will be explained in detail in the next section. Here we will also discuss two other challenges for ICT support.

Issues in ICT support for communities and groups

Adjustment and adaptation
Searching for a fit between a group and a groupware tool reflects a contingency perspective. This perspective was formulated in reaction to the idea that there was 'one best way' to structure organisations (see Mintzberg, 1993). Applied to technology systems the implication of this perspective is that information and communication applications should perfectly match the requirements of the situation, the user and its context. There are different ways to achieve this object: conform the ICT application to the group, conform the group to the application, or apply a process of joint optimisation. A problem with this view is that the perspective as such hardly leaves room for change after the introduction of a system, so for adaptation or appropriation processes.

Experience shows that adaptation processes take place when a new system does not fit the users and context completely. The more a new system deviates from this match the more intensive and of longer duration this adaptation process has to be (Orlikowski et al, 1991). People using the tool, make the tool 'their own'. Hiltz, Dufner, Holmes and Poole (1991) give examples of appropriation: the group may use the system in a way consistent with its spirit, but change or circumvent the intended mode of use of specific features; or it may violate the spirit of the structure, but retain its operations, using them in unintended ways. In the worst case a group may alter both the spirit and the specific features of a structure. So, just supplying a group with a certain tool can have a variety of consequences. Grudin (1994) therefore states that groupware requires more careful implementation or introduction in the workplace. This implementation phase is at least as important as the design itself, otherwise it is very possible that adaptation takes place in a way that is not optimal.

Tailorability versus uniformisation
The aspect of adaptation is not the only problem when trying to find a perfect match between group and used groupware. An occurring dilemma with ICT is that although on the one hand the applications offered to a community should perfectly match its needs, on the other hand, organisations should stimulate using uniform platforms and applications in order to make it possible to communicate and share applications between different locations and/or communities. Here we see the dilemma of ICT tailorability versus uniformisation, which is a common problem in modern organisations. When the tool is extremely tailored to the group, it is possible that the group becomes isolated from its environment, because communication with other groups, using ICT, may become difficult. Or the used tool does not fit with other tools used by the members of the group, so they cannot integrate their groupwork with their other daily activities.

Wenger and Snyder (2000) also mention a related paradox that communities and companies in which they exist encounter. *"Although they are self-organising and thus resistant to supervision and interference, they do require specific managerial efforts to develop them and integrate them into an organisation. Only then they can be fully leveraged"*.

Critical mass

Often an application can only support group processes if the whole group or community uses it. When an Intranet is not up-to-date because only half of the group keeps its part up-to-date, it is for the whole group not attractive anymore to use the Intranet and put effort in it. The same holds for the feature to synchronise on-line agendas: when only one of the members of the community does not keep his/her on-line agenda regularly up-to-date, this option does not work at all and only results in frustration. This implies the need for bottom-up accepted groupware. However, groupware may not enlist the 'critical mass' of users required to be useful, or can fail because it is never to any one individual's advantage to use it (Grudin, 1994).

In sum, this chapter has presented several insights from literature: Increasingly, organisations need each other to 'improve' their knowledge level, innovative abilities and competitive advantage. Therefore, even competing organisations co-operate in alliances, where they have the risk of meeting an interorganisational learning dilemma. However, in order to find conditions for effective learning in such alliances, it seems important to consider the interpersonal level of groups. Thus, we have discussed several types of groups, and communities in particular. Communities have the aim to share and develop knowledge on a specific practice. They can develop along several stages. Finally, several conditions for effective knowledge sharing and development are presented in this chapter. In the next chapter we will first look into the methodology of this study in DC, before we present some results.

2. Method and rationale

Our study has the goal to provide insight in the nature and dynamics of knowledge sharing communities in DC. It also aims to give conditions that influence this knowledge sharing. Before presenting results of our study in DC, this chapter will discuss our method used. The research at DC was performed in two phases: an initial orienting phase and an in-depth study of three communities. These phases are described below, after a short description of the case organisation itself. The first phase was supposed to last for 6 months, but took a while longer (10 months in total), because of the fact that it was very difficult to discern (clear) communities in DC, and therefore to select the right ones, as will be explained below.

2.1 Delft Cluster

The DC network was formally established in 1999 and is co-sponsored by the Dutch government for at least four years (with a long-term plan of 12 years). The organisation consists of a supervisory board, board of directors, work group communications, programme directorate (with at least a scientific advisory council and programme management), Theme management and project managers and members. Thus, it is a rather formal structured network organisation.

The five participating knowledge institutes of DC are:

- IHE (International Institute for Infrastructural, Hydraulic and Environmental Engineering)
- TUD (Delft University of Technology), Faculty of Civil Engineering
- GeoDelft
- TNO (Netherlands Organisation for Applied Scientific Research)
- WL | Delft Hydraulics.

The sector for, with and in which DC works is the GWW[6] sector (Civil and Hydraulic Engineering). This sector consists of investors and managers of public and private infrastructures and organisations in construction and engineering.

The research programme of the first four years of DC is organised in seven 'Themes':

- Soil and Structure (Theme 1),
- Risk due to Flooding (Theme 2),
- Coast and River (Theme 3),
- Urban Infrastructure (Theme 4),
- Subsurface Management (Theme 5),
- Integrated Water Resources Management (Theme 6) and,
- Knowledge Management (Theme 7), which is a supporting, facilitating theme for the other six, more content-based Themes.

Each of these Themes has defined several projects in which interested sector organisations can participate, thereby functioning as an ‘open’ alliance. The projects contribute to the overall DC goal to strengthen its knowledge and position in the field of prospects for sustainable

[6] Grond-, Weg- en Waterbouw

development of densely populated delta areas. DC has the ambition to develop into an internationally renowned knowledge centre.

2.2 Phase I: Orientation

The goals of the first, orientation phase were mainly to inventorise types of CoPs in DC, in order to select the groups for in depth study in the second phase. We also had to get acquainted with the practice of civil and hydraulic engineering, and in particular prospects for sustainable development of densely populated delta areas and with the structure and goals of DC. Therefore, several data collection activities were used. First, data on communities in DC were collected through document analysis. Several brochures, flyers, documents, such as project proposals and reports, but also websites and results from the 'KnowMe' project (see below) were studied. On websites of DC and its participant organisations we found a number of topics of interest. These can be considered as potential practices. Appendix A gives an overview of these topics and disciplines. It was expected that some communities could be found as informal networks around these practices. Second, a few orienting interviews were held with researchers dealing with Knowledge Management issues within DC.

Further, within DC a KnowMe inquiry was set-up aiming to indicate and measure the knowledge sharing activities within the alliance. One of the questions asked in the survey was whether the respondent had joined any community of practice. If so, they were asked to fill in the size of the group, its subject (practice), its (DC) relevance and whether it was a national or international group. We had the possibility to scan the answers of this survey, showing a quite diverse list of networks, organisations, and groups that were considered communities in the KnowMe project. This list is presented in Appendix B. It appeared that the term 'communities' is rather ambiguous: everyone had its own interpretation of the term.

Despite the ambiguity of terminology, we used this list as an entrance to select respondents for in-depth interviews in this orienting phase. We contacted those people who stated they participate in several communities (that were not merely organisations) and/or who had written down many comments concerning this item. We tried to select people from a range of institutes and Themes. As far as possible, considering the particularity of the sector and respondents, we have chosen both male (5) and female (1) respondents and senior (5) as well as less experienced (1) people. All of them were researchers, although one of them proved not to actually participate in communities, but rather to facilitate them. The six respondents were immediately willing and ready to co-operate. As guideline for the interviews we used our community quickscan. This was developed at the TU Delft, according to a refined input-process-output model (Andriessen, 2002). The short checklist –or quickscan- is presented in Appendix C. Thus, the interviews were semi-structured and in-depth and usually took one and a half hours.

The result of this first phase was that we collected information on at least 11 communities. A description of these communities can be found in Appendix D (grey boxes). From these 11 communities we could not further look into those that were international, because of potential problems of accessibility. We neither selected those groups that consisted only of people from one organisation (intraorganisational communities), because particularly the interorganisational communities were a focus.

For the second phase of the research within Delft Cluster we had originally planned to study the most interesting[7] communities amongst those identified via the first round. However, it became clear that several of these communities exist more as "latent networks" of a core group of people rather than as an active community. And, in general, CoPs were very hard to find in DC. Therefore our extended task of the first phase became one of selecting appropriate communities for in-depth research (a rationale for selection will be given in the following section).

In an attempt to increase the success and usefulness of the in-depth phase of research, and while trying to find more appropriate communities than those identified via the initial orienting phase, we performed further telephone interviews. These interviews (of approximately one quarter of an hour per interview) were performed with six other employees who had responded to the KnowMe inquiry and listed communities that had not already been discussed at previous interviews. We asked people to tell us about the communities they had listed in the KnowMe inquiry. In total we approached seven people, of whom six responded, although only five felt they were indeed part of one or more communities. These five discussed a total of eighteen communities.

The telephone interviews did not provide us with any obvious choice of new communities for study, as can be found in Appendix E, were we discuss some of the results of these telephone interviews. Our rationale for selecting communities to study in-depth is thus provided below.

2.2.1 Rationale for selection

In general, communities in DC appeared less 'obvious' or present than expected. Although many groups were mentioned in the KnowMe inquiry (see Appendix B), many of these appeared to be 'just' emaillists, large formal organisations, or a collection of students – without a shared practice or identity. However, it appeared that certain ways of working of the participants in DC were said to be important for the way they share and develop knowledge. Therefore we decided to monitor those ways of working in several groups that had the characteristics of a community as described earlier, although these were not formally refered to as communities in DC itself.

We have chosen to investigate three communities in-depth. We have focussed on these three communities for the following reasons:
Firstly, the group should have all of the characteristics of a community as we mention in our definition. Secondly, we chose for those communities that seemed 'rich' and (fairly) accessible. Further, there are two additional characteristics for selection, namely if there was a range of ICT tools being used within the community or if there appeared to be 'co-opetition' – simultaneous competition and co-operation. These characteristics initially made us decide to choose for the communities of Nederlands Centrum voor Kustonderzoek (NCK), Technische Adviescommissie voor de Waterkeringen, werkgroep kust (TAW Kust) and Nederlands Hydrologisch Platform (NHP) as initial communities for further in-depth study.

[7] from a knowledge sharing point of view: those communities which had competition issues and/or those which made varying use of ICT facilities

NHP community was selected as it was a new venture: the community was just starting, was based on co-operation between a number of organisations, and was mediated by ICT. A community in its infancy can provide valuable lessons.

'Latent' communities, such as NCK and TAW Kust, were rather hard to identify (or at least get access to), because they are 'invisible'. Therefore, they could better be approachted through the Themes of DC, in which many of their participants also took part. We chose to select those people and groups who worked on the subject 'water' ('wet-infrastructure' section of DC), such as hydrologists. Or more general, researchers and engineers in the field of coasts, rivers, integrated water resources management and risks due to flooding. These subjects included people from Theme 3, 6 and 2, in addition to the more visible and formal community of NHP. These simultaneously were the Themes which seemed the most 'stable' in number of members[8].

2.3 Phase II: In-depth research

The second phase had the goal to collect data from selected communities, and particularly to get insights into the nature and dynamics of knowledge processes in such groups. Therefore we needed to understand the ways of working of the people –mainly engineers- in DC. Once the communities, respectively Theme 6, Coastal Researchers and NHP were selected for in-depth investigation a combination of interviewing and surveying the community members was performed. The results of the interviews will be presented later in this report. Below we will first explain these two methods in more detail.

2.3.1 Interviews

The interviews in phase two were semi-structured and took approximately 1,5 hours. Subjects discussed were background and expertise of the respondent, examples of knowledge sharing activities in the context of competing organisations, critical success factors for knowledge sharing and development, examples of innovations in the particular practice, (personal) network analysis to understand the overlapping memberships, and the issue of competition. We have tried to get many concrete examples in order to be able to get insights in the dynamics of –and contextual influence on– how 'communities of practice' –and in particular the participants- work.

Data on respondents

It proved hard to find sector members to do interviews with for several reasons. Because we used the data from the DC Intranet, we did not find much data on sector members, as the people mentioned on the Intranet mainly work for the knowledge institutes. Here, differences, e.g., in sector participation, exist between the Themes: as shown in table 4. A second reason is that many of the people from the sector organisations that were mentioned in this Intranet list appeared to have changed jobs, or did not feel that they were actually involved with DC. Thirdly, they often indicated to be too busy to give an interview. However, we managed to do

[8] We expected to find most people from TAW Kust and NCK in Theme 3. Therefore, we have selected most of our respondents from this Theme. NCK in particular was also chosen because it was mentioned as a community in which several of the participating organisations of DC actively take part. Another reason was that it was considered to be a successful community in the orienting phase. As a whole, the challenge to control and manage water internationally can be seen as a typical Dutch topic (or area of expertise), and a highly innovative issue. Because of the overlap in 'groups', we will refer to "Coastal Researchers" when discussing insights from TAW Kust, NCK, and Theme 3.

interviews with 7 people from sector organisations in total. In general, all of the respondents were male and many have worked in the particular field of expertise for at least several years. Table 4 presents a full overview of the Themes of DC.

Theme	% of participants from sector organisations (in 2001)	Total number of participants in dec 2000	Dynamics: Departed and new participants on november 2001	Total number of participants on november 2001	Number of people interviewed[9] % of people working in knowledge institute (k.i) or sector organisation (s.o.).			
					Phase I	Telephone interviews	Phase II	Total
1	7%	42	1 gone, 47 extra	88	1 100% k.i.	1 100% k.i.	0 100% k.i.	2
2	52%	21	2 gone, 6 extra	25	1 100% k.i.	1 100% k.i.	4 50% k.i.	6
3	32%	41	5 extra	46	3 100% k.i.	2 100% k.i.	11 73% k.i.	16
4	43%	49	2 gone, 10 extra	57	0 100% k.i.	0 100% k.i.	0 100% k.i.	0
5	0%	13	1 gone, 18 extra	30	1 100% k.i.	0 100% k.i.	0 100% k.i.	1
6	9%	11	8 extra	19	0 100% k.i.	1 100% k.i.	5 60% k.i.	6

Note: Based on data of december 2000 (grey are selected for interviews in phase II). Data are found at the DC Intranet (formal figures). The interviews and discussions with Theme 7 members or those outside DC are not included here.

Table 4. Overview respondents

An overview of the non response is presented in the following table (Table 5):

Phase of research	Total number of non respondents (per phase) (% out of total approached people)	Theme
I	1 (14%)	6
I: Tel	1 (14%)	3
II	4 (18%)	2 (2x)
		3
		6

Table 5. Overview of non-response

[9] some were involved in several Themes

2.3.2 Survey

For additional data on how Theme 6, NCK and NHP functioned and could be characterised we issued a questionnaire. These groups were considered the most 'important and interesting' ones. In Theme 6, 18 people could be considered as our 'targetgroup'. There is a strong overlap between NCK, Theme 3, and other initiatives (such as TAW Kust) or researchgroups. Because NCK –especially on their yearly meetings- seemed to have the widest range of participants of all of these groups, we have chosen for them to fill in the questionnaire. From NCK 80 people could be considered as our 'targetgroup'. For NHP, the questionnaire was sent to approximately 70 individuals by e-mail, accompanied by a covering letter requesting that the survey be completed and explaining the role of TU Delft in the research.

In total we have not received much response (from any of the groups) on our questionnaire. From NHP we have received none and from the other two groups we have received some. Therefore we have decided to include only those results from NCK and Theme 6 in Appendix F of this report. Here we present facts and figures on both groups and compare them with each other as well. Strong limiting effects must be considered however, because of the low response.

In sum, this chapter in detail described the method used in the DC study. In the next chapter, the final results will be presented, including several guidelines that could be abstracted from them.

3. Results

This chapter presents the results of the study on knowledge sharing in Delft Cluster communities. Here we try to answer the main questions of this report, thereby providing insights in, conditions for and guidelines for successful knowledge sharing and support in DC communities.

DC as a whole is a special alliance in several ways. In the first place, DC can be considered as a regional cluster in Delft (comparable with Sillicon Valley). All of the five knowledge institutes are currently located in Delft, as well as the DC-staff[10]. Many of the DC researchers, in particular engineers, have studied at Delft University of Technology. The discipline of Civil Engineering for example can only be studied there. So people know each other and share a common background, and they have often worked for several companies in this particular region as well. This implies a certain regional focus of DC.

Secondly, DC to a large extent exists because of governmental funding (ICES). This requires an equal co-operation between knowledge institutes and organisations from 'the sector'[11]. These sector organisations can be '(semi-)governmental' (policy-oriented), such as parts of Rijkswaterstaat or subsidised (research) institutes, or 'commercial' organisations, such as consulting firms. It implies that in the DC alliance (potential) competing[12] organisations co-operate, coming from knowledge institutes, governmental and commercial organisations. This is one of the domains in which in the area of 'water' is a largely felt necessity for co-operation and integration[13].

Thirdly, people in DC –in particular in the knowledge institutes- all have professional experience with both sharing and development of knowledge. It often is their work to develop new knowledge in a particular area, as researchers do. Therefore, they can be considered as professional 'knowledge workers'.

A final characteristic of DC is that the management of the alliance did not formally 'install' CoPs as a knowledge management strategy. DC is a project-oriented organisation[14], and no formal groups can be appointed or discerned that are called 'CoPs'. This is different from organisations such as Unilever, Habiforum, or Shell, as mentioned earlier. In DC, neither communities exist that are composed of people from all (and only) the five DC knowledge institutes.

[10] DC does not have its own 'headoffice' as it is, to a large extent, a virtual organisation. However, most of the staff-members (communication group, and some board and administrative members) are located in one building.
[11] As explained earlier: The DC financing structure requires 1/3 by ICES funding, 1/3 of contribution by own (DC) partners, and 1/3 of contribution by sector parties (either passively or actively).
[12] See also footnote nr. 1
[13] Recently, an increased integration can be observed in disciplines (e.g., ecology, economy and civil engineers); topics (e.g., sand and mud); methods (e.g., modelling and data analysis); time scales (long term and short term); scales in space (large and small areas); and sector organisations and researchers.
[14] Comparable with a large research programme

All of these particularities of DC are important when analysing the nature and dynamics of knowledge sharing activities in DC. Within these particularities several lessons could be learnt and guidelines could be distracted as results of our study in DC. The structure of this chapter is as follows: Each of the selected groups, Theme 6, Coastal Researchers, and NHP, are described and analysed per group. These insights are summarised (italic lines) and sometimes translated into general guidelines (bulleted, italic lines). A short overview of some specific characteristics of each of these groups are presented in table 6 below. After an analysis of these group-specific processes, an analysis of a more general nature will be presented. This part also includes several general guidelines. All of the guidelines will be summarised in the next chapter.

	Theme 6	**Coastal Researchers**	**NHP**
Practice	Research in integrated water resources management	Coastal research	Hydrology
Age (phase)	Appr. 3 years old	Over 10 years old	Started in dec 2001 (and not yet operating)
Size	Appr. 20 people	Appr. 100 people	Appr. 75-80 people
DC parties involvement (number)	4x	3x	4x
Other sector organisations involvement (number)	2x	5x	9x
Main purpose (as indicated in the questionnaires that we did receive)	Developing new knowledge Sharing knowledge and experience	Sharing knowledge and experience Making useful contacts and networking Keeping members up to date in this field Developing new knowledge	Sharing knowledge and experience Making useful contacts and networking Contributing to acquisition of projects or customers Concrete, the goals of NHP are mentioned in the text (in *section 3.3*).
Activities	Meetings Projects	Meetings Projects Overlapping networks	No face-to-face activities Few ICT-based activities
ICT facilitation	Email Internet site Company Intranet site Phone/fax	Email Internet site Phone/fax	BSCW groupware tool

Table 6. Overview of characteristics of DC CoPs studied

3.1 Analysis Theme 6

3.1.1 Introduction Theme 6

Theme 6 is a rather small Theme in DC, centred around the practice of integrated water resources management. The Theme was initiated at the start of DC by several senior researchers, of which some are still the formal Theme leaders. Some of the participants had

known others, although most had not worked together before –in particular not as a group as a whole. Theme 6 can be considered as a community, consisting of approximately 20 people from six different organisations. Only two members are working in sector organisations, of which one indicated that he is not actively involved. According to the DC Intranetsite, 17 projects are defined for this Theme, related to three 'base-projects'. Although in each of the specific projects contacts with –or intense co-operation with- sector organisations is possible, it is not mentioned on the Intranetsite of DC. Real co-operation and knowledge sharing activities in particular, mainly take place in concrete projects. Here, people regularly meet and have discussions etc. In the next section we will present certain lessons learnt from Theme 6.

3.1.2 Lessons learnt from Theme 6

It appeared that people did not feel very committed to the Theme as such. This could be seen in the questionnaires that were completed and returned[15]. For instance, most people –apart from the Theme leaders- answered that they were not an active member. Further, people indicated that a downside of the CoP is that it remains rather 'noncommittal'. One manager even remarks that there is a lack of commitment, and another person states: *"the 'group' as such hardly exists"*. And, most do not feel a particular sense of belonging to the group. Many participants did not even return the questionnaire at all, sometimes explaining that they felt insufficiently active, interested or committed. Most indicated that they were mainly active in a particular project, without any overlap with other activities. Therefore, they did not meet many Theme 6 people outside this theme –or even outside their project.

Further, this CoP is characterised by the role of its management. Its Theme leaders have played an important role in designing the group, both in the (type of) participants, the subject and goals. This management feels it is important that senior researchers decide upon these types of issues, because they have a good overview on the research area –thus, parties involved and areas to be discovered. For the Theme management an important goal of DC is fundamental research, for instance in the area of integrated water resources management. One of them indicates that a weak point of the group is that there is currently *"often insufficient attention for doing real research" [T6,6]*.

As said, two types of sector organisations can be distinguished in DC, i.e. commercial and (semi-) governmental (policy-oriented). For many policy-oriented studies in integrated water resources management it is particularly important that the acceptance of their results in political and social (policy oriented) organisations is high. Therefore, a close co-operation with such parties is necessary. Most organisations in this area therefore already have experiences with co-operation in 'multi-disciplinary' groups. However, in Theme 6 few sector organisations are formally involved. One reason why it is said to be difficult for some governmental sector organisations to actively participate in Theme 6 –or DC in general- is the financing structure. Although especially these organisations seem to be interested in the long-term research results, they have to invest in several ways, that not always seem profitable. Many governmental organisations already invest in long-term research in knowledge institutes by means of 'special contributions'. If they are asked to invest again by means of 33% share in DC activities, this is considered additional. In particular, when it remains unclear how responsibilities are divided among the participants.

[15] Note remarks in *section 2.3.2* on Survey. Only 4 out of 18 members returned a completed and useful form (dd. aug. 5, 02).

As for outcomes, everyone in the questionnaire disagrees that the CoP directly contributes to a large cost saving and effectivity of the companies participating. Individual outcomes in terms of improved career prospects neither seem successful, according to the survey results.

Theme 6 is characterised by a strong management, a small number of participating sector organisations, and a low commitment of the participants.
DC needs to be aware that a small number of sector organisations participation can (also) be caused by a financial situation that is considered unequal.

- *Pay attention to commitment of members. A strong focus on and commitment to projects do not imply a (full) commitment to the Theme or CoP*

3.2 Analysis Coastal Researchers

3.2.1 Introduction Coastal Researchers

As mentioned in chapter 2 we have chosen TAW Kust, NCK and Theme 3 as networks for in-depth study. Here it appeared that a 'hidden' community of Coastal Researchers can be distinguished. TAW Kust, NCK and Theme 3 are institutionalised and they organise several activities, ranging from meetings with presentations, to initiating workgroups in which new research is being undertaken. It is the latent, hidden group of Coastal Researchers who often participate in these various –often overlapping– networks, that we consider a community, because it fully accords with the characteristics in our definition. The members all know each other well and need each other for their knowledge development. It appears that a 'distinction' can be made between various sub-practices within this field: researchers focussing on the natural (physical) processes (morphologists etc.), people working in policy-oriented work (coastal zone management etc.) and engineers (civil and hydraulic engineering). Many of the people interviewed worked in the first sub-practice. In the next section we will describe a typical characteristic of this community of Coastal Researchers.

3.2.2 Lessons learnt from Coastal Researchers

Overlapping networks, or latent community
One of the most obvious characteristics of the Coastal Researchers is that they can be considered as a 'latent' community. These people have several networks (around the same practice) in which they participate simultaneously and as a group they become active when necessary, i.e. in case of a 'request by the government or an opportunity to develop a common project, for example. *"Yes, there is no doubt about that: when dividing money (sponsorships) and writing joint project proposals, we know how and where to find each other quickly [T3,1]".* In that way they are not an 'official' or formally organised CoP, but a relatively 'latent' community that becomes active when necessary. In such cases the required people, such as money suppliers, can be contacted immediately. Many of the Coastal Researchers are experts in the field and consider the community as a network of peers. It is a relative stable formation –core – of people, that meet at conferences or in concrete settings, such as an advisory board or in a project oriented group. This is illustrated by a respondent: *"The key figures meet each other almost every week, ... in varying compositions. Not always the same group, but it is often a specific group of people that you always meet everywhere" [T2,3].*

As a whole the community is difficult to distinguish, but if you consider researchers from all of the overlapping networks as one latent community, it appears to have its own dynamics: *"In that steering committee are many large personnel overlaps in such discussion groups. Some of those people you meet in different fora. You can see a very large coherence in how the mass as a whole moves (...) these dynamics all interrelate and are also very predictable" [T6,5]*. And, *"Together we make a rolling train, we know how to find each other very well" [T2,1]*.

The various overlapping networks –which can be consortia, projectteams or other types of groups – in which Coastal Researchers (often simultaneously) participate are many. Delft Cluster is only one of these networks in which they participate and develop knowledge. Others are: LWI, Theme3, in particular the project Coasts; NCK; MARE (Flyland); DIOC water; Coast 3D; Coast View; and SandPit. Several types of organisations are involved, both national and international knowledge institutes (universities and GTI's), various sector organisations that have a strong link with the government, and some engineering and consulting firms. In The Netherlands, NCK plays an important role as a 'platform' for coastal researchers. Here much co-ordination –of activities within the overlapping networks- takes place. This network does not have its own funding, but it co-ordinates several other co-operations, mainly projects, for which funding can be found. Results and insights are discussed at special 'NCK-days' (meetings of two or three adjacent days each year). NCK developed out of a long-term project, initiated by Rijkswaterstaat (of the government). This had already started in the 80s. After a 'struggling' phase, NCK, now formally consisting of eight organisations, is considered to be a very successful knowledge platform that already found some 'successors' for other practices (e.g., NCR, for river research). Half of the respondents in our survey[16] indicated that they feel a sense of belonging to NCK. The other half neither agrees nor disagrees, but no one dissagreed.

Overlapping memberships

Overlap of networks is sometimes caused by an overlap of 'memberships'. These Coastal Researchers are often employed by several organisations simultaneously and in this way form cross-links between them. This results in overlapping memberships: *"someone who works for this GTI, often also works for the university" [T3,14]*. This can have advantages for the individuals themselves, but also for the community as a whole. A positive consequence of these overlapping memberships is that it is easier to find funding for research activities, because more sources can be reached. Senior researchers or top managers can play an important role in finding funding by using dual positions. A respondent said: *"People who are involved in several organisations have larger margins and often more power" [T3,15]*. Another adds: *"so there again you see such a 'double-hat' who takes care of business" [T3,13]*. They have access to more resources (as well as more communication takes place). Someone said about keyplayers in networks with a high overlap: *"These are people with a high authority, whom you will meet everywhere, and who always somehow or the other pull the strings. (...) and the funny thing is, that the network maintains itself" [T6,5]*.

If overlapping memberships exist, people can learn from each other in their daily practice, and select the best ways of working. Within NCK there appears to be a 'unwritten rule' that people must work in more institutes in order to get to know other people, methods, ways of

[16] See also remarks in *section 2.3.2* on survey. At august 5th 2002 we had received 17 completed questionnaires from NCK.

working and backgrounds, etc. In this way, particularly tacit knowledge can be shared, because people will have 'real' work-experience in concrete co-operation. Thus, the CoP of Coastal Researchers is said to be successful because of its overlapping memberships for instance. This enables people to find each other easily and know everyone. It enables them to have access to various money-sources while they focus on one practice. And they have several people that support co-ordinating where a lack of insight still exists in order to write research proposals for that.

Thus, overlapping networks –which is a characteristic of a DC group of Coastal Researchers- can result in cross-fertilisation between several networks. People and networks can learn from each other. And, overlapping memberships can cause an improved strategic approach (better access to funding for instance). Together they indirectly enable a strong cohesiveness (internally) and improve a high visibility (externally).

- *Create overlapping memberships and networks, while using a co-ordinating platform to collect, transfer, use and co-ordinate knowledge in a particular practice.*
- *And, do not (artificially) try to limit such networks to only those organisations in an alliance, as professionals will not accept that. It also has negative effects on creative knowledge processes.*

3.3 Analysis Nederlands Hydrologisch Platform (NHP)

This community was developed in order to bring together geographically dispersed individuals in The Netherlands, working in the area of hydrology research. The medium selected as the most appropriate to enable the community members to meet and discuss issues was an ICT platform, i.e. an Internetsite, where views could be exchanged, news items shared and conferences publicised. While some of the group members may know each other through proximity and employer, NHP has not facilitated face to face contact as yet.

In order to gain some understanding of and insight into this community, an initial interview was held with the ICT facilitator. Further discussions took place with this co-ordinator, who is one of the founders of NHP. We also attended a conference where the community was promoted and the software demonstrated. Finally, two of the researchers received a registration for the collaborative space of the website in order to note –at first hand- the type of exchanges which take place.

The NHP website was launched in December 2001 and is therefore a still relatively new CoP. It was introduced to bring together geographically distributed Dutch PhD students and their supervisors to facilitate the exchange of knowledge and ideas, theories, reading material, technical paper and grant proposal writing. The community brings together individuals working in a similar area who would perhaps not otherwise have the opportunity to meet. Membership has grown to approximately 75-80 people following a recruitment drive and publicity material promoting the community that took place at the above mentioned conference.

The goals of NHP, as mentioned on the site are the following:

- to promote hydrology as an independent science in its own right,
- to make an inventory of all hydrology research activities,
- to improve the communication between the PhD-fellows and the professors by serving as a meeting place, and
- to create a database with information on hydrology research in The Netherlands.

Hydrological research in The Netherlands is largely carried out by four universities, two international graduate schools and several institutes for applied research, who are all supporting this initiative.

This Internet based community was designed to fulfil the need for a focal point on hydrology research in The Netherlands. The community formulates themes for fundamental research, co-ordinates resources of knowledge and manpower, facilitates the application of research proposals and can be addressed to answer questions on hydrology research. On the website the headings 'NHP introduction', 'News and events', 'Participating organisations', 'Research programme' and 'Who is who' can be found. These topics on the website are accessible to everybody. This, however, does not hold for the collaborative workspaces that also can be accessed from the website. For this part of the site one must be registered. Only employees or members of NHP who are involved in research and all PhD-fellows are eligible to register. The facilitator, or co-ordinator of NHP functions as a content manager in this respect.

The collaboration system is a typical example of a 'different place, different time' group support system. It intends to support a group of users who are not in the same place and want to exchange documents, messages and other information without the necessity of being 'virtually' present at the same time. So the main purpose of the system does match the purpose and characteristics of the group as it is described above; but it appears that this is not enough in being successfully used. It is explained in section 1.3 that a new system also needs a careful introduction. Above that, individual users need to acknowledge individual advantage in using it.

There are indications that the system is overly complex. Unfortunately, members were not consulted on their preferences or requirements before the software was put in place. This is often one of the most important causes of a mis-match between requirements and functionality, with a perceived issue of overly complex technology. In NHP it at least showed that people have not made use of the technology at all (yet).

To provide some insight in the system in place, a short description of the functionalities is given here:

1. Document sharing (up- and download features)

Document sharing is a common feature in collaborative workspaces. People can add (upload) new documents or download them.

2. E-mails to distribution lists (either pre-selected or individually determined)

It is possible to send an e-mail to all or selected members, but using this e-mail feature is of course not obligatory. Members of the community can use their own e-mail system when they know the e-mail addresses of other members.

3. Discussion groups and threads

It is possible for members to start a discussion on the website, reactions on this discussion item will all be saved on the site.

4. Voting on items

When people would like to have the 'opinion of the group' they can start a vote.

5. Rating of items

Documents which are uploaded by one member can be rated by other members. This gives an indication of the quality of this document. The functionality provides in this way 'meta'-information of the different documents.

6. Set up meetings (either physical or virtual)
The system supports inviting or reminding people for a meeting.
7. Alertness service
It is possible to personalise some settings of the website. One option is receiving an e-mail when new documents or messages are added; the alertness service. So the website gives some options for tailoring.

Frequency of use of the discussed items can be checked by using the log files to track documents opened or e-mails sent. Based on this the facilitator feels that the group is under-utilising the platform and thus their knowledge sharing capacity. It appeared, while logging onto the website, that there were no activities on it (yet). Hardly any interactions or stored documents can be found. The only activity or information on it is added by the facilitator.

A questionnaire was sent out to 50 of the members via e-mail and no one responded. Further interviews were therefore not facilitated. So, it appeard that actually no 'real' group of people was active in NHP, at this stage; no substantial activities were found on the website and no reactions were given on our questionnaire. Because of this and that we were unable to reach participants, we have not found the reasons why NHP seemed to be under-utilised. It may have to do with goal compatibility or that the goals were unrealistic. It might have to do with a slow start, which could be resolved with a good kick-off meeting. Unfortunately, although it was planned, thus far such a meeting has not been organised yet. A kick-off meeting is also a good opportunity to give an introduction of the system and its features to the NHP members. At this moment people have subscribed to a tool of which they might not (yet) know all the possibilities. This can hinder them in recognising possible individual advantages in using it, which might have contributed to the low use-rate of the system (see also *section 1.3*). Or, it there is less need for a platform as such, as the type of group might actually prefer a more visible solution, or does not require it at all. One type of solution for this latter 'problem' is for example: Rather than to use the platform to write proposals on, it could be used as a place where calls for proposals are stored. In this way all members of the community can see what proposals are being tendered and members could develop expressions of interest.

In all, it unfortunately appeared unable to learn valuable, concrete lessons from the NHP case at this stage.

3.4 General analysis

DC has several specific characteristics that imply certain challenges. One is that it is an alliance in which (potential) competitive organisations co-operate. Another challenge is that knowledge institutes co-operate with sector organisations. These type of issues are analysed in more detail in this section. A third issue that will be discussed is related to the phases along which DC CoPs develop.

3.4.1 Co-operating competitors[17]

Theoretically, the co-operating organisations in DC can be considered as competitors because they (partly) act in the same markets in the same sector: *"You respect each other both as partners and as competitors. But because sometimes you are partner and sometimes you are competitor, you have a somewhat ambivalent relation with each other" [T6,6]*. In particular,

[17] See also footnote nr. 1.

engineering and consulting companies might find themselves on competitive grounds while working for DC. Whether competition is a 'real' issue for co-operating parties in DC and how this is 'handled' by individuals, is discussed below.

Respondents often appear to consider another organisation in DC a 'real competitor' for their organisation when it is fighting for the same job, money, task etc. This can occur when submitting competitive proposals, international tenders or quotations for example. One topic that people said never to share with 'competitive colleagues' is their vision –or their perception of market developments, for instance. They will not show their cards, except in a situation in which the parties have a third, mutual interest –usually a commercial goal. As a respondent said: *"I would not tell my plans I have for it. Or how I assess a certain development in the market. If no competitors are present at your discussion table, it is pleasant that you* can *do this: then you* can *assess how the other feels about it, whether you are on the same wavelength" [T2,4]*. And: *"Then you don't speak your mind. Except if it serves, for instance a coalition for a project or 'business' that you have together. As long as there is a mutual commercial goal that you agree on" [T2,4]*.

Competition can also happen when both parties have an interest to publish (e.g., an academic paper): *"I am not going to tell you exacly what the assumptions in my model are, because then you will make a publication out of that, while I also need that publication. I'm quite far with it in fact. So, if I tell you all about what I have come up with, you will write the publication. So I will not tell!" [T3,13]*.

Thus it seems that two 'types of competition' can be distinguished in the DC context: commercial and intellectual. Commercial competition focusses on the possibilities to collect 'jobs' (projects) and/for money, close to clients, while intellectual competition focusses on knowledge development. This involves people who work for different institutes, while working on the same intellectual, academically challenging innovative problems (and strive for the first and best publications). These two types of competition are interrelated, and often depend on the primary process of an organisation. For instance, for knowledge institutes their primary process is to develop and distribute knowledge, which often involves intellectual competition (with regard to publications).

In general, people who work in knowledge institutes tend to see themselves as rather open and willing to share anything. Most of them consider themselves supporting The Netherlands as a whole. *"We also see that we do not run into each other on/in the market (commercially spoken). It is even the opposite. That's why we would like to co-operate. I think together we are able to deliver a very good product for The Netherlands as a whole" [T6,4]*. They also are keen on receiving information and knowledge from others. About co-operation with foreign universities one respondent says: *"As soon as one group writes a paper, the others immediately request for reprints by email" [T3,14]*. Everyone wants to stay informed. Researchers often consider a publication itself as competitive advantage. In general, a difference exists between knowledge sharing while still being in a process of knowledge development, or knowledge sharing after it has been explicated in a publication or product. In the latter case, it is viewed as mere information: people do not consider it a risk sharing it then. Sometimes there is a risk in sharing (finished) publications however, when they are not allowed to do that by their client (for whom the specific report has been written).

A clear necessity for co-operation might influence the success of the co-operation positively. This success can be caused by a high complexity of the 'problem' or issue, for instance when the other party has knowledge you can never develop yourself, or because a third party (such as a client) asks for the parties to co-operate. As someone said: *"If you are certain to get the job by co-operating, you will co-operate" [T3,7].* In that case, there is a mutual interest: *"you could feel, institutionally, that all clearly focused on one case, and this has helped much" [T6,6]*.

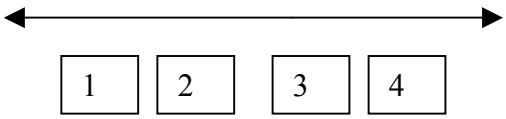
Some believe that co-operation cannot simultaneously exist with competition in one relation. One respondent illustrated that competition and pre-competitive co-operation could never be combined: *"I think, if you are purely entangled in competition with each other, it is almost impossible to come to a precompetitive co-operation. There is no way you can slap each other on the ears with one hand, while with the other you shake hands and open-heartedly share and develop knowledge together. We are not that dualistic, I think. You need to have certain deeper motives in order to (to be able to) do something together" [T6,5]*. This confirms the study of Bengtson and Kock (2000), as presented in the literature study. In the end, most people did not feel that they were that hindered by a mutual competition of their organisations: *"So, that 'competitive colleagues'' feeling now and then, you will meet during the year, but is doesn't have an annoying (interfering) form" [T6,4]*. Some feel that there is a difference between the operational and the strategic level related to knowledge sharing. One respondent said that at topmanagement level where strategic decisions need to be made, 'real' competition comes into play: *"there, people strategically want to go one or the other direction. That probably clashes much faster, I think" [T2,6]*.

Competition can appear in two ways in DC CoPs, and both can cause that knowledge is not shared. A shared goal, interest or necessity (at the interpersonal level) can 'overcome' direct organisational competition.

- *Try to find a 'transcendent' mutual goal, interest or necessity on which co-operation can focus, such as necessity by the organisations themselves or a third (governmental) party, a commercial enterprise, or a complex problem. Defining higly complex problems that can only be solved by true co-operation, for example, requires co-operation.*

3.4.2 Co-operation between knowledge institutes and sector

Another tension may evolve from the fact that sector organisations co-operate with knowledge institutes. A –fairly traditional- continuum on which organisations and institutes can be placed based on their perspective on research and work, is drawn in the following table (Table 7). On the left-side of the continuum, fundamental research oriented knowledge institutes are placed. On the other end of the continuum we place the applied research oriented (sector) organisations. Each have their own specific characteristics and key competitive issues. The ends on the continuum represent an inclination towards one of either orientations. Thus, it does not imply that in a knowledge institute as a university, no applied research can or does take place. In this section we will address several of these differences.

Orientation	Fundamental research oriented *Theory development*		Applied research oriented *Direct solution providing*
Characteristi	No/less hard		Hard deadlines

cs	deadlines Long term Not always a clear client present (theory oriented)	(with clients) Short term Clear client present (client focussed)
Key competitive issues	Intellectual capital	Client and market knowledge
Primary process	Research (deliver educational services and knowledge)	Consultancy (deliver services and products)

1= University (knowledge institute)
2= GTI[18]: combination of sponsored fundamental part and non-sponsored consultancy (knowledge institute)
3= R&D in a company (sector organisation)
4= Sector organisations, such as engineering-consulting firms

Table 7. Types of organisations in DC (continuum)

It seems DC has the ambition to combine the outer left 'extreme' with the outer right 'extreme', as can also be seen in the financing structure of DC[19]. However, many differences exist in paradigms, goals, motivations and interests, etc. between 'fundamental research oriented' and 'applied research oriented' organisations. As one respondent said: *"universities have (serve) a totally different goal than (semi)commercial organisations in this area" [T6,5]*. Or: *"When you work for a commercial consultant, your interests differ from someone working at a university… That's a given fact" [T3,13]*. An academic describes the way he sees the difference between the academic and more commercial worlds: *"A dredger who has developed a new method for dredging must even try harder to protect that, because it is his competitive advantage. Our competitive position will particularly be strenghtened when we have as much up to date knowledge as possible, and the fastest way to have that is through co-operation" [T3,6]*.

For fundamental research oriented organisations, reputation seems an important motivation to share knowledge with other people –such as potential partners, as will be explained further in *section 3.5*. These types of institutes are often 'rewarded' for the amount of publications (intellectual capital), which requires that they are informed about all developments in a particular field.

Applied research oriented organisations are thus different. Although some engineering and consulting firms collect a lot of (field)data, they are often not willing to share them –as that takes time: as not only the plain data, but also some more detailed contextual knowledge must be shared. Plus, this type of data can be considered of strategic importance for writing good tenders. These types of organisations appear to have more difficulties with allocating (enough) time –which is an investment- in long-term knowledge creating projects or co-operation. This

[18] GTI: Groot Technologisch Instituut (=large technological institute).
[19] More about the DC financing structure can be found in the beginning of *chapter 3* and in *section 3.1.2*

is because the *payoff* is less, or less clear, or takes too long. However, this is not valid for the individual motivation for co-operation: in many cases people exceed working hours. Thus, they often lack the resources (positive enabling environment) for knowledge sharing activities, because it is not always seen as their primary process in their organisation.

Thus, in addition to differences in goal and motivation, differences in potential (i.e., resources, capabilities, such as accessibility, etc.) exist between the two extremes on the continuum.

As a knowledge institute, GTI's have a specific role. Their particular goal is to function as a bridge between the two extremes. However, as one respondent said: GTI's always have a special relation with the sector organisations. GTI's *"have to listen perhaps more than average to what the client wants"*. They are in the middle: *"primarily, we depend on the sector, for they provide our funding. On the other hand however, we receive a vast amount of money from several subsidies from the government"*, which is used for more 'fundamental' long-term research [T3,14]. Therefore, some say that universities and GTI's are often in a far more luxeoureous position than commercial engineering and consultancy firms. However, as one puts it: *"Bottomline is always the money, also for knowledge institutes (GTI's)" [T6,4]*. A GTI however, will most likely be more expensive than the consultancy firm, which will give them an uneven position in the market. Further, GTI's formally are not allowed to compete with universities, because officially aim to serve as a bridge between universities and sector organisations.

Although DC wants to stimulate sector organisations to participate in long-term research, the current situation is still somewhat different. At the moment, a distinction can be made between horizontal knowledge processes –between researchers and engineers themselves, while working in a concrete project or organisation-, and vertical knowledge processes – between 'developers' (researchers) and 'end-users' (particularly, sector organisations). At least, this is still the case at the moment, as few sector organisations actively participate in the DC projects themselves. Some said that those engineering and consulting firms *"behave somewhat passively, and are actually waiting for something to be thrown over the fence" [T6,4]*. So they do not act (pro)actively, but are passive and will 'check' whether the results (from over the fence) of the researchers is useful.

An important question for DC is: Do you want to involve the sector organisations in concrete projects as active participants, and develop new knowledge together and learn from each other (and thus, let the distinction between horizontal and vertical knowledge processes dissappear)? Or, do you want the sector to have a more passive role as an end-user of the knowledge developed by researchers in DC?

Thus, DC needs to know what role sector organisations must fulfill in the alliance, because each choice will ask for a different type of approach and (financial) co-ordination.

And, it proved very important that results are communicated in the most understandable way for that particular audience. So, as one respondent had learnt in their project when they presented their long-term research results after some small adjustments to their sector organisation client *"the mutual understanding instantly boosted/increased enormously" [T3,14]*.

It is the task of sector organisations to precisely explain their expectations on how they want results to be (re)presented, in order to be useful.

Several solutions have been discussed to resolve or at least diminish the gap between fundamental research oriented and applied research oriented organisations. A good 'interface' can be stimulated by the following activities. These can be considered as guidelines:

- *do not consider it a gap in the first place: there is no real distinction between fundamental and applied research, they just have a different timeslot (there is more time for fundamental research)*
- *in general, communicate better between the two groups –therefore have more meetings and discussions in which points of views, interests and responsibilities are clear-*
- *in particular, the communication might improve when researchers understand the perspective of the clients (and their clients). Therefore, discussion between them in particular must be stimulated*
- *the communication in particular might improve when researchers invest time to explain or communicate their results in applied propositions that can easily be used by or discussed with 'sector organisations' (instead of using the formal 'scientific' way of reporting: 'questions for further research')*
- *let the 'sector organisations' describe and present results (from fundamental research) in their own words (after consultation of researchers)> this can also be a more general solution for a better 'understanding' of the environment of the other. Therefore this can also be formalised in role-plays or in extensive discussions (or meetings where researchers visit the client of his client)*
- *a different way of distributing ICES funding might be necessary: the specific departments of the government might function as intermediaries> they will have as their task to distribute the ICES funding in a 'good' way (this resembles the way GTI funding is done)*

As mentioned in the beginning of this chapter, one specific difficulty of co-operation in DC is that it is a regional cluster. This resulted in the development of a strong core (practice and people) around which research and development is centred. In this region, switching between different employers is relatively easy –and good for the flow of knowledge between companies. However, in some occasions it was felt as an imbalance between Delft and the rest of The Netherlands. DC is Delft-dominated, while it should be focused on development on research into prospects for sustainable development of densely populated delta areas in The Netherlands as a whole. *"DC is a closed front to the greater glory of what is happening in Delft" [T6,4]*. Some therefore prefer the name Delta Cluster over Delft Cluster.

3.4.3 Developmental stages of communities

As indicated earlier, a community can develop along several stages (see literature study). When using five stages of development; orientation, conflict, conflict solution, active performing, and dissolution, we can illustrate the issues communities deal with per phase.

1. Orientation phase

In the orientation phase the potential for co-operation needs to be explored. Therefore, a shared practice and parties need to be found and each party needs to assess if they will participate and to what conditions. Each organisation needs to invest in DC in order to partipate. It appears that, in allocating ICES funding, some organisations assess other organisations as a 'competitor' for that money, and chose to work alone as much as possible.

Sometimes organisations then come to the conclusion that they *"allow each other not enough (...) so that we want to do the largest part ourselves" [T6,4]*. Which means that they perceive a higher benefit at that moment from working alone, than from co-operation.

In DC the initiative to co-operate often stems from a top-down initiative, but can also be initialised bottom up. In Theme 6 we saw a preference for a top down approach for finding the topics for research. Here, the management of the Theme also appeared to have a say, or at least an initiative, in the combination of participants. The two Theme-leaders, who have worked together for a very long time, have had an important role in the start-up and overall co-ordination of the Theme. From a relatively top down perspective, one of them said that leaders or managers of the various concrete projects, as well as the management of the separate institutes/partners in DC (alliance) have an important role to play in the success of the co-operation. Further, in his opinion, leaders of a project or co-operation need to have a co-ordinating role in the composition of the group. In this community, the leaders have played an important role in the definition of the practice (research themes) and the group of participants.

In NHP the initiative to start also came to a large extent from the co-ordinator of the community, in combination with 'managers' –or senior reseachers- from the participating institutes. However, whereas Theme 6 has succeeded in forming a group that does work together, NHP seems to be still in the orientation phase. Here, (web)activities rarely or not take place.

The community of Coastal Researchers is a follow up of a long project that started in the 80s. Because of its (proven) usefulness, the group of people itself was 'destined' to keep working together on the same type of goals and activities. As some said: it would have been a waste to stop at that stage. Therefore, NCK as a co-ordinating platform was initiated. Here, all other activities in other networks and groups could be discussed and co-ordinated, in order to be able to detect the 'white spots' in coastal research and 'fill them in'.

In general, this orientation phase seems to be a very difficult one, which involves much assessment of all parties whether to participate or not, to what conditions and to decide on the concrete practice and goals etc. of the community.

2. Conflict phase

Trust (in particular habituated and cognitive trust, as explained in *section 1.2.3*) develops through time and when people have experiences with each other. Bad experiences in a first phase however, cause much reluctancy to participate in DC: *"... we are not interested because we have bad experiences with LWI" [T6,4]*. Conflicts and other difficulties may still develop once parties have decided to co-operate. Constant dynamics exist and participants constantly assess whether they will continue the co-operation.

The causes of conflicts most mentioned were those that evolved from the fact that different types of organisations had to co-operate (as explained in the previous section). This caused language problems, incompatible interests or other difficulties.

3. Conflict solution phase

In order to continue co-operationg, conflicts need to be solved somehow. It seems however insufficient only to have the *intention* to co-operate and share knowledge. Co-operation actually needs to be operationalised (as will be worked out in greater detail in section 3.5. As

a respondent explained: co-operation not only needs 'intentions'; *"agree on the goals ... a joint goal, because if you don't have that, there is no real reason for co-operation"*, but especially 'operationalisation': *"if here it says the word 'fisheries', for example, I need to ask: 'what do you mean with that?'"* and: *"that you are talking about the same (correct) variables. That is very trivial" [T3,13]*. Respondents recognised that (intensive) communication can lead to an improved situation: *"In the beginning you can see that everyone is reluctant, but as they communicate more intensively, some sort of solidarity or unity starts to develop" [T3,15]*. Thus, communication has an important role in dissolving reluctance to co-operation and increasing mutual understanding or even trust.

4. Active performing phase

Once decided to continue the co-operation, a community can be active and perform. In DC, the actual work of knowledge creation and sharing is mostly done in joint projects, while broader reflection about the practice is sometimes done in community meetings. This is in particular valid for the Coastal Researchers, as they have 'broad' meetings for NCK in which an overview is given of all latest developments in the practice of coastal research in The Netherlands. In particular, the board of senior researchers in NCK has an important function in writing new research proposals that can provide answers to new research questions, -or, 'fill in the blanks' in that particular area. Further, as said before, these researchers co-operate in concrete projects as well –in several types of networks.

One respondent nicely illustrated the development of his community of Theme 6, which is currently in the active performing phase: They didn't know each other (well) at the start. In the first phase, discussing projectplans, *"you could see a fairly amount of non effective consultations"*. In this phase, activities focused on the development of 'rapport' (trust) and of a mutual understanding of goal, concepts and language (terminology). Then they organised several sessions (both for the projectteam and for a larger audience) and held additional interviews with experts in the field, which he both considered to be of utmost importance for the progress of the co-operation. *"That gave people a renewed view on where we want to go"*. So, the goal came into sight again, regained attractiveness, which invoked energy. This phase ended with a final report, which also made people feel 'proud' (and committed). In the current phase, people now have dynamic, heated academic discussions about the subject. The respondent illustrates: *"we have had several projectteam meetings, from which everyone said: 'that was a good meeting. Now we are really working on innovation'"*. He also has the idea that *"motivation of people is driven by supergood content-focused discussion"*. People actually reserve time, because they feel they will gain something from it (progress is made). And, as he calls it, they are in a phase of 'knowledge-fusion' currently (everything comes together). To illustrate this integrative atmosphere he said: *"People have opened up"*, which has lead to a creative process. It should be mentioned, that this is an example of a co-operation in which the various partners indeed have to work together (instead of only be responsible for a sub-part of the total and one party co-ordinating everything). [T6,5]

5. Dissolution phase

The CoPs studied have not reached the phase of dissolution (yet). Theoretically, a community can dissolve after several events. In the first place, it can stop before even actually having started. This can happen because there is too much overlap or too few commonalities –or added value- for the co-operation. Secondly, a conflict might be un-solvable, which can cause a termination of the co-operation in an early stage. Then, finally, a community can also develop through all of the phases mentioned earlier and then reach a stage where a high

performance is finalised. People can be satisfied or not about the (tangible and intangible) results.

Thus, CoPs can be described to develop along several phases, with accompanying activities. Both Coastal Researchers and Theme 6 are currently in the active performing phase, whereas NHP is still in its orienting phase.

3.5 Success conditions

In this section we will discuss DC experiences with regard to conditions that might improve 'success' or effectivity of communities, and learning and knowledge processes in them in particular. These were mainly conditions that people considered important factors for successful co-operation in the CoPs. Although a sharp distinction cannot be made easily, we have ordered them from 'organisational level characteristics', via 'CoP level characteristics' to 'interpersonal level characteristics'.

3.5.1 Organisational support

In general, but in particular in Theme 6, respondents felt that the management of DC of and the separate participating organisations, need to stimulate people in the various organisations to share their knowledge, so that they feel safe to do so. *"I think it requires (from) the management to create and provide a positive enabling environment" [T6,6]*. This enabling environment can consist of both 'soft' factors (trust etc.) and 'hard' factors (funding, time, etc.). It also involves a political lobby, if necessary.

- *At both alliance and community level, management needs to create and provide a positive enabling environment for knowledge exchange and creation (both 'soft' and 'hard' factors)*

In general, when many (competing) priorities exist, a leader might be able to keep the network alive, he/she can for example "even roads" and/or show the added value of the community to its environment. As one respondent said: *"(...) when the supervisor who organisatorically held the group together left. So, there was no leader anymore. And he was considered internally as the binding factor within the group".* So, a leader can play an important role as a 'champion' for the community, and should therefore be supported by the organisations. (S)he should have enough resources and responsibilities.

On the other hand, if this support and stimulation is not reflected in concrete actions, co-operation and knowledge sharing has low priority. As someone said: *"look, here too you are swayed by the issues of the day, you're enormously busy and this is an aspect you are not judged on, so it comes secondly" [T3,16]*. And: *"a large part can just be considered 'for love only'" [T6,1]*. Reflection and knowledge creation (exploration) takes time and 'space'. If this is not provided by the organisation employees have to visit meetings of their community in their 'own, spare, time'. Such a procedure may convey to the participants that management does not really value the CoP-work. So, organisational support –by providing an enabling environment- is necessary. As a respondent indicates: *"Then it is a condition that they are allowed [or supported] by their own firms" [T3,6]. And: "Your organisation must agree of course, and enable you. Of course I can say that I enjoy it to exchange software, but if the product manager won't allow that, that's it. The organisation therefore needs to support it" [T3,6]*.

Management should not be too restrictive in allotting time for CoP work, both for co-ordinators and participants. Precisely indicating work hours can have a negative influence on knowledge sharing and creation if community-activities do not fit in. Then, CoP activities tend to be under prioritised.

- *Show a genuine commitment as organisation (which involves an investment)*

3.5.2 Small versus large organisations

In some communities members come from organisations that differ in size and hence in 'power' in the field. This can have its repercussions on the relations between the members of the community, since some are then considered to be more 'powerful' than other members. Smaller parties must know what happens in the larger ones in order to be able to keep up and play along. The smaller ones must be complementary in order for larger organisations to gear their activities. As one said: *"Anyhow, we are a small player. If you compare that with the other [larger organisations]: if they think they should change their mission, then we can think all we want of it, but if they think it is necessary, they just do it" [T3,1].*

A party that is very large and a monopolist, is said to be less dependent on a small party than the other way around. Therefore the smaller organisations constantly need to adapt to changes etc. in order to stay 'valuable' to the larger organisations. From other cases it proved to be difficult to co-operate when organisations differed highly in size.

3.5.3 Organisational relations

In this section we will show that both 'overlap' and 'complementarity' are necessary in a co-operation. We will first present insights from practice, before we will introduce a 'model' with modes of complementarity.

In Theme 6 the organisations that co-operate shared their practice of integrated water resources management and the need for a (political and social) acceptance of the results in this area. Most of the participants knew each other –though often not from their own experience- at the start of the CoP. In the projects of this Theme the people of the various organisations had the chance to get to know each other. Then they try and find out how they could complement each other to improve their shared practice together. They differed in disciplines for instance, which can be considered as a complementarity.

In the CoP of NHP, the shared practice was the topic of hydrology. All people invited did research in hydrology in one of the participating institutes. In NHP the organisations did not have former experience with all of the other organisations before the start of the NHP community. They could have heard from each other, or even have co-operated with some of them, though never in this exact constellation. Therefore, it was unclear where any overlap and complementarity could be found. Because there have not been many activities in this group, this still remains unclear.

The Coastal Researchers differ in disciplines, as said before, as well as on other aspects. In the introduction of chapter 3 we have presented several areas in which integration –and thus co-operation- is required, such as methods, topics and time scales. Further, respondents indicated

that they also share, for instance, backgrounds and employers (overlapping memberships). They are even said to share the same kind of humour: *"I think that they are all a fairly similar type of person. They even have a similar type of humour" [T3,7]*. *"So, it is a group of people who just understand each other very well, and who all originate from the same organisation" [T3,7]*. Thus, these aspects are 'overlapping'.

In general, three situations can exist for organisations that co-operate in an alliance. These situations are drawn in the following figure (figure 1).

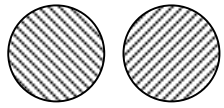
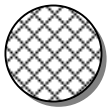
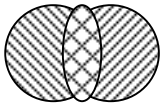
I		In the first mode, there is no overlap in the two different organisations at all. This does not imply that they are competitors, as they do totally different things. There is nothing that binds them.
II		In the second mode, two organisations have a full overlap (but no complementarity). This implies that they are full competitors, as they do exactly the same things. Co-operation seems highly unlikely, because they have nothing to offer each other.
III		In the third mode, both complementarity and overlap exist. The organisations have a part in common. However, they also have a part that is different from the other which is valuable to the other, a complementarity. They can add value to the other party. They can learn from each other, for instance. Therefore, there is a potential for co-operation.

Figure 1. Modes of overlap and complementarity in organisational relations

The question remains: what exact part should have an overlap (commonalities) and what part should be complementary?
In the interviews people often mentioned that the third mode (both complementarity and overlap) is the 'best' if (effective) co-operation is your goal. From the interviews it appeared that 'overlap' was often interpreted as a shared language and understanding (cognitive aspects). *"The overlap (...) had to be there however, because you need to be able to understand each other, and you need overlap for that" [T6,5]*. Another said: *"Parties that co-operate need to have overlap in order to be able to have content-focused discussions (...), because if you don't understand each other, it's the end of the co-operation" [T6,4]*. Another type of overlap can be found in the physical closeness or more general, the accessibility to the other organisations (regional cluster). Or, organisations can share the same practice or interest, which can 'bind' them. Another, more personal factor that can cause overlap, commonality or even cohesion, is whether people 'like each other'. This aspect will be explained in more detail later in this section, when we deal with success conditions.

Complementarity –as appeared in the interviews- can be found in the knowledge that is present in the other organisations. Someone said: *"Because our eventual goals still differ some, we could co-operate as well" [T3,8]*.

Respondents further said that the overlap should not be too large, for organisations might become too competitive in that way. *"But, it should/could not be too large as well, otherwise you would be on each other's territory" [T6,5]*. Another said: *"if that overlap is too large, it*

will, I think, become a risk for your competitive position to show into your cards or speak your mind" [T6,3].

Co-operation is difficult when there is no shared goal, understanding and/or other factors that bind them. So, overlap is necessary to some extent, as one respondent illustrated: *"The one has its strong points in that area, and we have another strength" [T3,1]*. And: *"In many areas they just have more expertise* in house*, but we make use of it in a very good way just by co-operating well and knowing what happens and is at stake" [T6,1]*. If there is complementarity, *"you're not interfering with each other, and then you can easily share and tell your findings (...) because with that you make the mutual co-operation in fact even easier"*. One respondent said: *"I see increasingly that complementarity develops in The Netherlands as a whole" [T6,4]*. The need for co-operation is caused for instance by specialisation of organisations that focuss on their core competencies.

Overlap and in particular complementarity can be useful both for selecting a suitable partner, and for developing a logical allocation of tasks. In the allocation of tasks, the one with the largest experience is the most obvious leading partner of a particular task –in which that specific 'competence' is most required. Often, respondents indicated to have known already quite precisely the (core) competences of the other organisations. *"We also know where the overlap is. So, where you 'link' each other with a piece of logical and necessary overlap (...) and where the 'real' overlap is and competition comes into play" [T6,4].*

Thus, overlap (of interests, background or understanding) is necessary to be able to communicate with each other and find each other. However, it should not be too large.
Complementarity (of knowledge level and competences) is necessary to be able to add value to the co-operation.

- *Enable both overlap and complementarity in co-operation between organisations in CoPs*

3.5.4 Goal

If there is a clear need for the co-operation of all parties, it enables them to find each other and to make the co-operation successful. This can be caused by a high complexity of the 'problem' or issue –the other party has knowledge you can never develop yourself, and thus complementarity is required-, or because a third party –such as a the interest of the country as a whole- asks for the parties to co-operate. Some examples: *"I mean, it is a very complex problem, so I will never be able to solve it on my own" [T3,8]. "So you just need each other anyway. Those are the professional areas you are 'ignorant' about" [T3,6]*. Or: *"(the work) is fairly often of strategic importance to the country. That often implies that all the experts in The Netherlands need to 'agree' to some extent with what is said. That just requires openess" (...) "Additionally, when you are certain that you will get the job if you co-operate, you co-operate!" [T3,7].*

Competitors or clients both can increase the importance for co-operation as well. This can involve the feeling of: 'us' *against* 'the (third) other'. Or, *for* the (third) other (as a client): *"When you need to complete a task together, the interest of the client always comes first"*. Further, at least, as someone said: *'it should be clear that the interest of one could not harm the interest of the other party' [T2,3]*. Some examples of the importance of the necessity for co-operation: *"What is also important, is that eventually the higher commercial goal was also*

a mutual interest". And: *"If you are in a project together, or you have to develop something together, or you have a shared business to run, then it is as if you are in the same boat: there is a clear mutual interest" [T2,4]*.

A factor that can provide a community with the necessary overlap (as in the third mode of figure 1) is an agreement on a clear mutual 'goal'. Is it important for all the community members (both individuals and organisations) to have the same goal(s) in order to function successfully? Sometimes it appeared hard to define what the precise goal(s) of an established community is, especially when participants are very different from each other (especially between solution oriented and problem oriented organisations).

It appears to be important for individuals to have consensus concerning the goal of knowledge exchange, understand each others interests and clarity exists as to the nature of the practice. Thus, it is necessary to have a clear and concrete practice in order to 'bind' the members and to function successfully.

3.5.5 Community typology

Based on experiences from the DC practice we have developed a 'typology' of inter-organisational communities, which is based on two dimensions. This typology is discussed in more detail in Soekijad and Huis in 't Veld (in press), as can be found in Appendix G. The first dimension refers to the fact that knowledge sharing communities can either focus their main activities around the exchange of existing knowledge, information and experiences, or around the development of new knowledge. Some illustrative comments of the first are: *"another very important aspect is that it is a way to hear and know what is going on elsewhere"*. *And: "My role is mainly to be a listener: acquire knowledge (...) and stay op to date" [T3,2]*. The development of new knowledge together is sometimes done in the form of joint research: *"In the context of [this community] agreements are being made about the different parts of research"*. Most of the R&D related activities deal with complex and novel knowledge. Thus, these communities have new knowledge as their main focus (of activity). We suggested that, depending which of these two foci a community has, it requires a different type of organisational or technological support.

The second dimension refers to the fact that DC communities on the one hand can have a 'visible' character and consist of people who only meet and know each other within the context of that particular group or community. In these communities it appears that while the practice, and thus the focus of the community remains the same, organisational representatives can replace each other. An example of this is NHP. On the other hand communities can also exist as latent groups that are difficult to distinguish (as a more or less 'core network'). These communities, such as Coastal Researchers, are thus less visible, as they have no name or face, nor any formal label. Although both types of CoPs have the characteristics of knowledge sharing communities, we have not found literature on the latent, less visible communities. We suggested that both 'types' of communities have their own ways of working and therefore have their own needs for organisational or technological support.

These dimensions reflect important community differences found in DC. Besides, they are very useful for improving the understanding of communities and particularly in the discussion on which type of support, both organisational and technological, is most applicable. For instance, for the purpose of sharing existing knowledge, a shared database for instance, would be useful. However, this is often not sufficient or useful for the creation of new knowledge,

where discussion boards or brainstorm-tools are more successful, for example. And, people who were members of a less visible community mostly had developed their ways of working already, which is very hard to change. Most members of this type of communities did not appreciate the introduction of new tools, they just wanted to use what they always used, considering themselves to be effective in that way.

So, try to make the focus of the community explicit and find the appropriate ICT that supports this focus.

3.5.6 Composition

"The most important thing for the right to exist of this type of club is that you pay careful attention to the composition of the club: that attention is paid to the nature of each, and which characters it combines" [T2,3]. Within a community –at the individual level- a certain amount of complementarity is necessary. According to some respondents in DC, the group should be composed of individuals who have an overlap and complement each other. They should be complementary in expertise, knowledge level, and even personal character. Overlap might involve a shared background, humor or other interests. When they have a shared identity they can easily form a group, but in order to stay a group in which learning occurs, diversity is required as well.

It can have advantages for the continuity of knowledge flows inside a community that participants (individuals) have complementary skills and competences. This may enlarge the attractiveness (competitive advantage) of each player [individual level].

3.5.7 Formal agreements for co-operation

Organisations theoretically can find numerous possibilities for co-operation with all kinds of parties, but unless it is made concrete somehow it only remains with intentions. In DC this is done in several ways. One manager said for example, that people almost always want to share their knowledge, but that more important reasons for not sharing are that people *"do not encounter (meet), or because you haven't thought about it directly" [T6,6]*. Thus, organisations and people need to be able to meet each other and know what the other parties do and need. They must be aware of all the potential.

Other, specific ways to make co-operation concrete can be through agreements. Especially where competitors co-operate, clear agreements appear to be desirable: *"At a certain moment things are made explicit, from which you can conclude that we are competitors" [T6,4]*. What this implies can be found in a so-called 'declaration of intent'. Although there is a risk that it remains paper only, a letter of intent can serve as a basis for co-operation. It can serve as a formal *"green light from the top to the 'workers'"*, after which the actual co-operation often takes place in concrete activities. *"The actual co-operation develops when you are together, working on a specific task (job or assignment)" [T6,4]*.

An important reason for drawing up agreements is to prevent later conflicts: *"because we could make good agreements beforehand, it has never led to any problems"*, and *"...when you agree beforehand that we will develop it together (co-develop). So you make an estimate (budget) of all costs involved, and you invest in it yourself, and you need to control everything 'project-like' that it is done on the same level, and then you finish the project" [T6,4]*. In a

trustworthy situation or relationship you need to be able to speak your mind. *"Openness to be able to say: I know I promised…, but it all went wrong"* Or: *"I just couldn't do it"*. Thus: *"it is very important to clearify the assumptions and uncertainties in your approach" [T3,13]*.

Once organisations have met and decided to co-operate, they need to explicate (or make concrete) this co-operation. This can be done by agreements for instance. These can involve agreements on the goal, activities, added value to each other, expertise or other resources that are necessary, etc. Concrete activities are often a good 'trigger' for getting to know each other and actually learn from each other.

The following factors were mentioned as important guidelines:

- *Agreements beforehand on a clear goal and how responsibilities and roles are divided are important, but they should not be made too 'tight' (impossible to live after),*
- *properly link finances to the agreements, and control the process on the way (through time), responsibilities need to be 'addressed' throughout the process (manage effort, progress and result),*
- *and clearly mark the end of activities, and the co-operation as a whole.*

Facilitation of a CoP can be done by giving support in making explicit: roles, responsibilities, conflicts, language, interests, goals, expectations, requirements, questions, etc.

- *the parties need to get to know each other, and each others ways of working, vocabulary, etc. Concrete co-operation (and have face-to-face meetings) seems a necessary condition to invoke discussions that need to be concerned,*

3.5.8 Trust

"You don't trust an organisation. You only trust people" [T2,3]. Many people state that if it doesn't work at a personal level, the co-operation will not work at all. This can include both affective trust (whether people like each other) and personal contact (do social activities together). Several people said that co-operation only works if personalities (or characters) matched and if there was enough mutual respect. Then, knowledge sharing is said to occur almost automatically. Some illustrations: *"That people on a level can get along is of utmost importance" [T2,4]*. Or: *"If people, on whatever level, cannot get along with each other, problems quickly appear" [T3,15]*. And: *"Someone that you have had a good time with in a café, you can get into contact with more easily next time" [T3,6]*.

One respondent explicitly gave an important reason why people do not always invest in new relations and share knowledge with 'new' people: *"Everyone has its own people with whom he discusses the issues. And it is actually quite an ordeal to enlarge your own world"*. … which means: *"in fact start all over again with: what are in fact your goals and what do you want to achieve? You need to put energy in it" [T3,16]*. He said that if you have found several people you like and find useful –although perhaps not optimal-, you stick to them and do not want take the time and risk to invest in a new relationship.

To maintain (and build) real (knowledge) communities usually takes some time. It involves strategic 'manoeuvring' and a good relationship, as illustrated below: *"Sometimes a relationship grows. That is also a matter of whether someone is satisfied (...), then they return to you" [T3,3]*. People can also become dissappointed in a certain relation, which influences

co-operation in the community in the future: *"We have had an experience with doing a job without being paid afterwards (...), so then you hesitate saying 'yes' immediately".*

Communities are (also) based on personal relations. These take time to build.

- *Thus, provide community members with such time. 'Just' a kick-off face-to-face meeting may not be sufficient.*

3.5.9 Passion

For several communities the strong interest, motivation and effort of the members concerning the activities and continuity of the community was explicitly mentioned. Much CoP activities, i.e. reflection and discussion, takes place in the 'spare time' of these highly enthusiastic researchers. Their motivation and interest, for example for becoming better in the practice, or for keeping up with the latest developments, appear to be very important. Some communities show a particularly active core of fanatic researchers, who make a large progress: *"If someone joins and becomes active.. The more active someone is, the more he will be asked [to do things]. That is how I put myself in front" [T2,1].* And: *"they are the pioneers in new developments: that is a very small group of people. Sometimes I get the feeling that they see each other more often than they see their wives. They are the real 'idiots': they are possesed by their job (topic)" [T3,2].*

Often this passion crosses organisational boundaries, which makes organisational competition an issue less present. People co-operate well because they just like a particular person, irrelevant to where (s)he works: *"people often say: I work with Paul, and whether Paul works here or there, he's just very good. He is a pleasant person to work with" [T6,6].*

- *Try to find or stimulate an active core of preferably extremely enthusiastic and (instrinsically) motivated people, that can serve as an important driver for the community.*

3.5.10 Comparable as peers

Several people interviewed said they would be (more) willing to co-operate and share knowledge with peers, because they are peers or specialists in a certain, very small area. This relates to a commonality that can make it easier for people to understand each other. *"The thing that binds them is that they are complete hydrology-freaks" [T2,3].* There is recognition and they are happy to share their thoughts with other specialists, they say. And because they have a comparable level of knowledge in the same practice, this can even create a certain level of energy to improve each other. *"Because you are 'co-opetitors' you want to show that you are at least as good. So putting them together causes that they try harder". "You need that incentive, and you need to stimulate each other a bit in order to aim for the highest possible" [T2,3].* In particular, the creativity in each other needs to be stimulated, some respondents said.

3.5.11 Personal reputation

For many researchers reputation is a personal strategic advantage: Specialists are often invited (e.g., by clients) because of their personal reputation and knowledge level. Therefore, most of the respondents state that they are not afraid to openly discuss and share their knowledge,

because they have invested too many years in building that particular knowledge. It cannot be transferred that easily, they believe. Some illustrations: *"eventually this world is about personal knowledge: because, at a certain moment you have a reputation. And because of that reputation you will be asked or invited to do things... Plus, it is not a world with hundreds of specialists. So the need for that particular knowledge and expertise is almost always larger than its supply" [T3,7]*. And, *"Many of the things I have done can be found (are explicated) in reports. There is nobody who can exceed my level or reputation in a few years time. So, I don't have to be afraid for that" [T3,7]*.

Because it is only a small world of peers and specialists (or highly expert people), who always seem to be able to find each other, this also asks for people to have high integrity standards and be loyal. If you 'lie' or present yourself better than it is, it will eventually be discovered (because it is a small world) and work against you, is the impression of many. A solution needs to work, if not, it will/can damage your reputation (as a person, as well as an organisation as a whole). As someone said: *"it are all small worlds. You cannot do anything 'crazy' or wrong, cause that will be noticed by everyone immediately!" [T3,7]*.

As long as it is respected, reputation (valued expertise of a person) can be considered as a factor that makes knowledge sharing easier for that person, because (s)he feels no threat and even feels 'rewarded' (status)

4. Conclusions and guidelines

This final report has the goal to provide insight in the nature and dynamics of knowledge sharing in DC and differentiate conditions that facilitate or hinder this knowledge sharing. We refer to technological, organisational and social conditions. And we aim to develop guidelines for the design and maintenance of technological and organisational support. In particular, the questions will be answered of how people share knowledge in the specific context of co-opetition, as well as how their co-operation in CoPs develops.

Whereas in the previous chapter we have presented several insights and conditions for knowledge sharing in CoPs, in this chapter we will sum up several conclusions of our research. We will further present guidelines that could be abstracted from the results of our study in DC, and in particular in three CoPs. This chapter concludes with points for discussion and further research.

Considering the specific characteristics of DC as a whole, several lessons learnt can be identified. DC is a regional cluster of professionals that have experience as knowledge workers. This regional focus has the advantages of closeness and the ability to meet face-to-face. And because of an often shared background, people can relatively easily find a common ground. Negative aspects of this regionality are that people from outside Delft sometimes feel 'left out', not understood or not taken seriously.

DC is also characterised by a (required) co-operation of different types of organisations that in theory can be considered as competitors. These partners include both knowledge institutes and sector organisations –both (semi-)governmental and commercial. This co-operation appeared to involve many difficulties and challenges. Both types of organisations (knowledge institutes and sector organisations) each have their own ways of working, goals, questions, motivations, potential, etc., which often appear uneasy to combine. Important is an unambiguous understanding of the role –and support- of sector organisations in DC (which appears to be not always the case). Several solutions have been discussed to resolve or at least diminish the gap between fundamental research oriented and applied research oriented organisations. A good 'interface' can be stimulated by the following activities. These can be considered as guidelines:

- *do not consider it a gap in the first place: there is no real distinction between fundamental and applied research, they just have a different timeslot (there is more time for fundamental research)*
- *in general, communicate better between the two groups –therefore have more meetings and discussions in which points of views, interests and responsibilities are clear-*
- *in particular, the communication might improve when researchers understand the perspective of the clients (and their clients). Therefore, discussion between them in particular must be stimulated*
- *the communication in particular might improve when researchers invest time to explain or communicate their results in applied propositions that can easily be used by or discussed with 'sector organisations' (instead of using the formal 'scientific' way of reporting: 'questions for further research')*
- *let the 'sector organisations' describe and present results (from fundamental research) in their own words (after consultation of researchers)> this can also be a more general*

solution for a better 'understanding' of the environment of the other. Therefore this can also be formalised in role-plays or in extensive discussions (or meetings where researchers visit the client of his client)

It proved hard to find CoPs in DC that we could use for in-depth study. DC has not 'installed' any formal CoPs as a knowledge management strategy, as organisations such as Unilever, Shell and Habiforum do nowadays. When found, we have studied three CoPs more in-depth in DC, each with their own specifics, as presented in the first part of chapter 3. NHP is different from Theme 6 and the group of Coastal Researchers in the sense that it is still in its first developmental phase. Few activities and meetings have (yet) taken place. It further aims to rely (heavily) on the ICT tool that they use as their primary facilitation. Theme 6 is a small group characterised by a strong management, a small number of sector organisations and a low commitment of the participants. The Coastal Researchers have overlapping memberships and networks, that appear to be useful, in particular in combination with a strong co-ordinating platform (NCK). These latter two CoPs are in their active performing phase.

No groups could be found currently in DC that called themselves 'community of practice'. No groups exist that are composed of people from all (and only) the five major DC knowledge institutes. But, the in-depth study in three groups in DC that had the characteristics of a CoP provides insights in the ways of working in such groups. These insights can be useful in case DC in future wants to 'install' or promote (formal) CoPs. Below we will present several guidelines that can be used for this purpose for instance.

Driven by value to members

A CoP differs from a team and is to a large extent driven by its members. A CoP can only exist when participants consider it valuable and voluntarily share and develop knowledge in it. Communities are based on personal relations and these take time to build.

- *Pay attention to commitment of members. A strong focus on and commitment to projects do not imply a (full) commitment to the CoP.*
- *Do not try to 'force' people who do not like or know each other to share knowledge or to co-operate. Thus, provide community members with such time. 'Just' a kick-off face-to-face meeting may not be sufficient. At least provide them with time or opportunities to develop a personal 'bond'.*
- *Try to find or stimulate an active core of preferably extremely enthusiastic and (instrinsically) motivated people, that can serve as an important driver for the community.*

People need a certain organisational support for participating in CoPs. Organisations, as well as facilitators or co-ordinators of a CoP, can provide an enabling environment for co-operation and knowledge sharing activities. This involves the facilitation of various resources, such as time, a good co-ordinator and ICT support. A genuine commitment often involves a certain investment. Too restrictive control on time allocation can negatively influence commitment and voluntarity of CoP members.

- *At alliance, organisational and community level, management needs to create and provide a positive enabling environment for knowledge exchange and creation (both 'soft' and 'hard' factors). Thus, provide a good co-ordinator as well as time, for instance.*
- *Show a genuine commitment as organisation (which involves an investment).*

Instead of depending on personal relationships to form spontaneously, organisations or people can make a co-operation more concrete. They can enhance several conflicts (as can appear in the second developmental phase) to be solved fairly easy or even nipped in the bud by making some (formal) agreements. Facilitation of a CoP can be done by giving support in making explicit: roles, responsibilities, conflicts, language, interests, goals, expectations, requirements, questions, etc. Co-operation between parties that differ too much in size can have a negative influence on the relationship of the parties and the processes of knowledge sharing.

- *Agreements beforehand on a clear goal and how responsibilities and roles are divided are important, but they should not be made too 'tight' (impossible to live after),*
- *properly link finances to the agreements, and control the process on the way (through time), responsibilities need to be 'addressed' throughout the process (manage effort, progress and result),*
- *and clearly mark the end of activities, and the co-operation as a whole.*
- *Organisations in an alliance (that are basis for CoPs) should not differ too much in size.*

Binding forces

Several factors can appear to bind people in a CoP. Composition seems an important issue, for instance. It appeared that people are inclined to share most easily with people they could refer to and whom they considered peers. It is also easier to co-operate and share knowledge with someone that has a shared understanding, language or interest. However, in order to be able to learn from each other, CoP members should have enough value to add, by privinding additional knowledge in the group. Thus, a certain level of overlap is useful, while complementarity is also required.

- *It appears that many highly expert people feel 'challenged' by co-operation with peers to reach higher levels of knowledge.*

Another binding force can be found in the practice of the community. The clearer and concrete the practice is defined, the clearer the group can be composed and the clearer its goal can be identified.

- *Find and in particular, formulate a concrete and clear practice.*

Further, co-operation and knowledge sharing activities are stimulated when there is a clear need for it. This can be because the government (or any other party) requests organisations to co-operate in order to receive funding. Co-operation can also be required because of the high complexity of a problem or issue in the practice that can only be solved by several parties.

- *Try to find a 'transcendent' mutual goal, interest or necessity on which co-operation can focus, such as necessity by the organisations themselves or a third (governmental) party, a commercial enterprise, or a complex problem.*

Overlapping memberships and networks appear to have a binding function as well. In particular when a strong co-ordinating platform is present, such overlap can enhance a tight group of people around a particular practice. Overlapping networks can result in cross-fertilisation between several networks. People and networks can learn from each other. And,

overlapping memberships can cause an improved strategic approach (better access to funding for instance). Together they indirectly enable a strong cohesiveness (internally) and improve a high visibility (externally).

- *Create overlapping memberships and networks, while using a co-ordinating platform to collect, transfer, use and co-ordinate knowledge in a particular practice.*
- *And, do not (artificially) try to limit such networks to only those organisations in an alliance, as professionals will not accept that. It also has negative effects on creative knowledge processes.*

ICT support

As NHP shows, to 'build' a CoP based principally on an ICT tool, is very difficult. Of course we cannot prove that the reason why the CoP is still in its first developmental phase, showing no activities (yet), is its heavily reliance on ICT. Other cases have shown that virtual communities can indeed also be successful. Several guidelines for ICT support could be found also in literature and other experiences in practice.

- *Where possible consult those who will be using the technology on their requirements, level of expertise and commonly used software.*
- *Introduce software that members can already use, or provide training early in the life of the community.*
- *Encourage feedback on the useability and functionality wherever possible.*
- *Evaluate training programmes to ensure that user requirements are met by the training.*
  - *Checking log files for frequency of logging in or sending of e-mails seems a reasonable measure of communication traffic of the community, but does not provide any information on the quality of the communication process nor anything about sharing knowledge or learning. Such measures should not be used to rate the effectiveness of a community of practice.*

Discussion and further research

Some points for discussion still remain at the end of this study. Although we have presented various 'modes of complementarity' in organisational relations in *section 3.5.3*, it still remains unclear how large the overlap and complementarity indeed need to be in order for communities to function successfully. This is however not the 'right' question to ask, because many contextual factors play a role in this too. Further, other results presented may refer to a meta-level discussion as well, but we have mentioned them in this report because of their importance. Most conditions mentioned are a refinement of or affirmation to literature on communities.

In this report we have discussed results of a study in Delft Cluster. Because this is a very specific alliance, it would be useful and important to study the issue of knowledge sharing in competitive environments in other alliances as well. These can be alliances that focus on policy matters, and alliances between organisations that are highly competitive (such as in bio-pharmacy), for instance. Or, it could be repeted in alliances with participants who are not professional 'knowledge workers'.

Another interesting research topic that concerns knowledge sharing in groups in project organisations, is how knowledge is passed and shared along different projects. This can

involve both projects that are executed simultaneously, and projects that are done subsequentially. How do people in these projects build on each others knowledge?

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Appendix A. Overview of mentioned topics/practices (in Dutch)

Deze info komt van de verschillende sites (en links) van Delft Cluster en haar deelnemers.

NB. Het is dus een inventarisatie (=tijdelijke moment opname, statisch)
Grond-, weg- en waterbouw: werken aan de duurzame inrichting van laaggelegen dichtbevolkte delta- en kustgebieden**.**
Grote infrastructurele werken, stedelijke infrastructuur (waaronder ook bodemsanering) en integraal waterbeheer.
Bijdragen bij de ruimtelijke ordening van laaggelegen deltagebieden, landaanwinningprojecten, het ontwerp en de bouw van grote infrastructurele werken buitengaats en bij het bouwen van spoorwegen, wegen, tunnels en bruggen, ondergrondse ruimtes, overkluizingen en waterkeringen in en op slappe grond. Verder worden bijdragen geleverd aan de duurzame inrichting van stedelijke gebieden met wegen, pleinen en riolering, aanleg en reconstructie van wijken, winkelcentra en bedrijventerreinen, bij bodemsanering en alles wat zich verder in de sector grond-, weg- en waterbouw voordoet.
Ondergrondse infrastructuur
Bovengrondse lijninfrastructuur
Waterkeringen
De thema 1 basisprojecten zijn:

- verkennen, meten en monitoren
- materiaal- en ontwerpmodellen
- nieuw numeriek laboratorium
- waterkeringen
- wegen en spoorwegen
- omgevingsinvloed ondergronds bouwen
- ondergrondse constructies.

afwegingsmechanismen voor de gewenste betrouwbaarheid van waterkeringen onder extreme belastingen door hoge waterstanden en bijbehorende golfbelastingen en het ontwikkelen van een filosofie voor het optimaal ontwerpen en onderhouden van primaire waterkeringsystemen
De thema 2 basisprojecten zijn:

- Belastingen op waterkeringen
- Faalmechanismen en sterkte van waterkeringen
- Gevolgen van overstroming en aanvaardbaarheid van risico's

waterbouwkundige kennis nodig van de omgeving en voorspellend vermogen over het gedrag van watersystemen over een breed scala van tijd- en ruimteschalen.
De 3 basisprojecten zijn:

- Systeemkennis
- Waterbouwkunde en geotechniek
- Omgevingrespons
- Aansluiting met eindgebruiker

het verbeteren van het rendement en de functionaliteit van de infrastructuur. Ook is het de bedoeling een brug te slaan naar de dagelijkse praktijk van bestuurders, planvormers, ontwerpers, uitvoerders en beheerders.
De 4 basisprojecten zijn:

- Cimcure, mgtsyst voor duurzame herinrichting stedelijke infrastructuur
- Duurzaam en integraal bouwrijp maken
- Integrale reductie nadelinge gevolgen van herinr. Sted. Infr
- Ecologische stedelijke infrastructuur

duurzaam toekomstig beheer van de bodem in stedelijke, industriële en landelijke gebieden. Concepten en technologieën worden ontwikkeld voor actief beheer van bodem en grondwater.
De 5 basisprojecten zijn:

- Reactiviteit van de bodem

- Integraal regionaal bodembeheer
- Transportverschijnselen in de bodem

Het watersysteem wordt hier beschouwd als een samenhangend geheel van het natuurlijk deelsysteem (het water met zijn kwalitatieve en kwantitatieve eigenschappen, zijn natuurlijke processen en de infrastructuur), het socio-economisch deelsysteem (de functies) en het administratief-institutioneel deelsysteem (de beheerders, wetgeving, etc.).

De 6 basisprojecten zijn:

- Concepten integraal waterbeheer
- Watersystemen
- Thematisch onderzoek

Appendix B. Based on KnowMe project: Distinguished communities

In this list we can find all of the communities (CoPs) that respondents in the KnowMe project (survey-part) mentioned they participated in. In the first column the name of the community is given, in the second column the quantity of participants or members, and in the third column whether it is a national or international group of people. It must be mentioned that a small part of the respondents had an explanation of the CoP concept before filling in the questions. Most of them had to do with a description in the forms. Thus, they answered the questions in accordance with their own judgement.
NB Last 2 colums explained: checked are those discussed with respondents, not applicable (v) are those that are international, too large mailinggroups or mere organisations (formal), or (x) mere formal groups that already are the subject of research (DC, LWI, Habiforum, etc.) or other not applicable formal organisations (CUR, CROW, etc.).

Naam COP	Aantal personen	Nat/Int.	checked	not applical
Afstudeerders	?	N	v	x
AIO-beg.groepen	20	N		x
AIO-netw.	15	N	v	x
Bangladesh: SWMC		I	v	v
Bel.analyse Hoogwater	14	N	v	
Bel.analyse TBM	15	N	v	v
Beleidsanal	8	N	v	
Beleidsvorming ICT Ned.	10	N		
CKM	10	N		
Coastal Engineering	?	I	v	v
Coastal Zone Management Centre		I	v	v
COB Leiding	20	N		x
Comm.of practice	150	i	v	v
Consulting Firms	?	N	v	x
Cornelis Lely Stichting	50	N	v	
CROW	50	N		x
CROW		N	v	x
CUR	50	N		x
CUR B83	10	N	v	x
CUR Cie's		N		x
CUR-kader	?	N	v	x
DC	?	N	v	x
DC zelf	100	N		x
DIOC's		N		x
Disc.platforum BOS	50	N	v	v
DOSO	15	I		v
DOW			v	
DWW			v	x
Ecologie	10	N	v	
eigen org AIO	5	N	v	x
Enkele DC-projecten	?	N	v	x
Env. Forensics mailing list	?	I		v
EU-proj.	50	I	v	v
EU-projects		I		v
EuroGeoSurveys (Marine Policy Sector)		I	v	v
Foregs (Marine Contact Group)		I	v	v
gebruikers van diana software	1000	I		v
Geohydrologie-overleg			v	
Geotechniek; veiligheid gerelateerd (i.h.b)	20	N	v	
Geotextielen	300	I		v
Goetechniek; incidentele int. Contacten	10	I	v	v
GTI	8	N		x
GTI	10	N		x
Guchemische kring	150	n		
Habiforum	10	N		x
Habiforum	100	N	v	x

HASKONING			v	v
Hydroinformatcis	30	i		v
INCOSE	100	N		
Institute of Information Scientists	1000	I		v
Instituutssectie	7	N		x
International Commission for the Environment of the Sea		I	v	v
Jong GD	20	N	v	
Kenniscentrum WUR/TNO	30	N		
Kennismanagement	300	I		v
KM Thema 7	20	N	v	x
Kon. Ned. Chem. Ver./Sectie KM	25	N		
L+I>> LWI	?	N	v	x
Landelijk hydrologisch platform	10	N/I	v	
Landschapsecologie	500	I	v	v
Marktoverleg	20	N	v	
Marktstrategieteam	8	N		
Meerv.Ruimtegrbruik	10	N	v	x
NARIP	?	N		
NARIP	150	N		
NCR	40	N	v	
Ned. Ver. Beroepsbeoefenaren Bibl-, Informatie- & Kennissector	4000	N		
Nederlands Centrum voor Kustonderzoek (NCK)		N	v	
Nederlands Centrum voor Kustonderzoek (NCK)	?	N	v	
Nederlands Centrum voor Kustonderzoek (NCK)	50	N		
Nederlands Centrum voor Kustonderzoek (NCK)	100	N	v	
Nederlandse Geotextiel Organisatie			v	
Nederlandse Oceanografische Data Commissie		N	v	
NSTT wg'en	6	N		
NTV (trillingen/dynamics)	50	N		
NVRB (risico-analyse)	300	N		
NWO		N		x
Onderzoeksschool Waterbouw	50	N	v	x
ONRI	25	N		x
Org.Geochem. Mailing list	500	I		v
oude studiegenoten	10	N	v	x
Overkluizingen (COB)	35	N	v	
Politiek Forum	25	N		
Predicting the structure of the subsurface	13	N		
Probabilistiek/Risico-analyse algemeen	50	N/I	v	
Raad van Overleg voor Zee-onderzoek, Overleggroep Bodem, voorzittersoverleg (RvO)		N	v	
RIZA		N	v	x
RWS	?	N	v	x
SBR CROW		N		x
Sedim.model for port of Rott.	15	N	v	
SETAC	25	N		
SKB	?	N		
Slibonderzoek	100	N	v	

TAW		N	v	
TAW	?	N	v	
TAW	?	N	v	
TCB	15	N		
Technet Delft	80			
Veiligheid/Risico's overstromingen/Waterkeren	30	N	v	
VKB	30	N		
VLCA	25	N		
Waterbodems GeoDelft	5	N	v	
WG-ontwerp	10	N		
WSM-club			v	

Appendix C. Community quickscan (in Dutch)

Wat
1a. Kunt u het thema (onderwerp) van de 'community' omschrijven (=practice)?
1b. Hoelang heeft *u* ervaring met dit onderwerp (=practice)?

Wanneer
2a. Welke periode bestrijkt de 'community' (en de activiteiten) *(start-eind en duur)*

Wie
3a. Kunt u een beschrijving geven van de 'leden' van de 'community' (kent u iedereen)?

- *Samenstelling en betrokkenen (mate homogeniteit)*
- *Mate van 'gedistribueerdheid' en 'historie'*
- *Leeftijd, expertise, discipline, teamrollen, gender, ervaringsniveau, kennisniveau, diensttijd, geografische spreiding, hiërarchie, 'oude-bekenden'*
- *Aantal en oorsprong van de 'units' waaruit men afkomstig is (eigen organisatie of afdeling).* Zijn er binnen de community leden die uit 'concurrerende' organisaties afkomstig zijn?
- *Rollen (bijv. facilitator, champion, core member, other)*
- *Initiator*
- *Grenzen/omvang (hoe permeabel en toegankelijk? Hoeveel leden (actief)?)*

3b. Waar kent *u* de mensen met wie u in de 'community' samenwerkt (projecten, e.g.) evt. al van voordat het een 'community' was?

Waarom
4a. Wat is de doelstelling (verwachtingen en motivaties) t.a.v. de 'community'? (en *uw* doelstelling?)

- *Doel (als bindend element) (bijv. kennisdeling, probleemoplossend of status of product providing, individual learning, organisational innovations, etc.)*
- *Focus (eenvoudige routine 'dagelijkse problemen' oplossen (single loop learning) of eerder lange termijn innovatie processen (double loop learning), etc.)*

Hoe (ook faciliteiten)
5a. Kunt u omschrijven hoe de 'community' wordt georganiseerd (en gefaciliteerd), gelet op de volgende punten?

- *Formalisatie en structuur*
- *Formalisatie van de start/origin (eerder top down formeel geïnitieerd, met centraal geselecteerde 'leden', of meer informeel, bottom up)*
- *Formalisatie van de coördinatie (aangewezen of opgekomen facilitator, coördinator, of andere 'leiders')*
- *Taken & verantwoordelijkheden*
- *Regels en afspraken*
- *Bijeenkomsten*
- *Faciliteiten (geld, mensen,)*

5b. Welke ICT toepassingen zijn er beschikbaar en welke worden in de 'community' gebruikt, en met welke intensiteit?

- *Mate van virtualiteit (hoog of laag, m.b.t. face-to-face ontmoetingen en het gebruik van ICT).*

5c. Welke plaats neemt de 'community' in bij *uw* eigen organisatie (en hoe gefaciliteerd)?

Processen

- **6a. Kunt u een beschrijving geven van wat er zoal plaatsvindt in de 'community' (aan activiteiten)?**

let op: WAT, HOE, HOE VAAK, WAAR, WANNEER, WIE?

- Hoe *gecommuniceerd*?
- Hoe *gecoördineerd*?
- Hoe *samen gewerkt* (activiteiten)?
- Hoe zit het met de ontwikkeling van o*nderling vertrouwen, openheid, onderlinge binding en gezelligheid*
- Hoe zit het met *kennis-uitwisseling: leert men van elkaar? Wordt nieuwe kennis gezamenlijk ontwikkeld; welk type kennis*

6b. Welke rol speelt de 'community' voor *u* (in practice) bij het vergaren (delen, creëren) van kennis?

Resultaten
7a. Wat is volgens u de toegevoegde waarde van de 'community' in het algemeen?
En voor *u* en/of *uw* eigen organisatie/unit? Hoe 'tevreden' bent *u* erover?

- *Factoren zoals: inhoudelijk kennisopbouw, kennisuitwisseling en leren, M&T en aanpak ontwikkeling of staven, ontwikkeling standaards, trendvolger, uitbreiding klantenkring of opdrachten genereren, PR naar buiten toe, status, steun door ervaringen te bespreken; netwerk van relaties vergroten of versterken; opleidingen ontwikkelen of genieten; strategisch belang, enz.*

Verder
8a. Wie beschouwt *u* (in de 'community') als uw (organisatie's of 'community's') voornaamste (potentiële) concurrenten (op welke punten, wanneer)? En hoe onderscheidt u zich daarvan? *Op welke punten ziet u elkaar (als 'community-lid') als conculega?*

8b. Met (bij) welke 'eenheid' (zoals netwerk, organisatie, groep, projectgroep, afdeling, 'community', enz.) voelt *u* zich het meest betrokken in het algemeen, in *uw* dagelijks werk? En waarom?

Appendix D. Description of the communities (phase 1)

In this part of the report the various communities discussed in the interviews of the first phase in Delft Cluster will be described. All of them meet the characteristics of the definition of a community as presented in chapter 1, but there are several differences among them. We have selected eleven communities, which is just a part of all of the existing communities in Delft Cluster.

The eleven CoPs will be clustered into three broad categories:

- Intraorganisational; A group of people working in one organisation, but in different units, departments or projects (3x).
- Interorganisational national; A group that consists of people working in different organisations in The Netherlands (6x).
- Interorganisational international; A group of people from organisations in different countries (2x).

Intraorganisational

When people work on the same topic in a small organisation, they can find each other rather easily. However, when the organisation is larger and people, who have a particular practice in common, are dispersed by projects or units/departments, it might be valuable to connect these people through a community. In this community they can share and build knowledge concerning their practice. Thus, these groups can be focused around expertise, professional discipline, skills, topics or other practices. Box 1 and 2 present two of these intraorganisational communities.

Community **"G.O. talk"** (*GeoDelft, Geohydrologen overleg*)

The Dutch organisation 'G.O.' was reorganised in 1996. The department that consisted of geohydrologists was decentralised into several units. Because the geohydrolists were separated, comparable problems appeared to be solved in different ways. This could negatively influence their image. One of the geohydrologists therefore decided to organise a community or network that re-united the geohydrologists in the organisation into a community. Also the management team became convinced that such a community was indeed necessary. Thus, the network "G.O. talk" was a fact.
'G.O. talk' unites 8 to 12 researchers of 'G.O.' who are very interested in the practice of geohydrology. These researchers have quite different age, experience and backgrounds. This very low-profile group meets every now and then to discuss relevant issues for geohydrologists, such as drainage design. Every two to three months (or more often if necessary), lunch-meetings (which are in 'spare time') are organised. The (approximately eight) people that attend the meetings actively take part in it. According to the respondent most of them are real 'narrow-minded specialists' who are very enthusiastic about their practice.
'G.O. talk' is considered to be important for the communication among geohydrologists in 'G.O.'. Although at some stage the community was expected to 'officially deliver' results (although it works in spare time), nowadays the meetings are more 'informal' again. The group takes time to discuss and reflect on the practice, following a small 'agenda'. The geohydrologists discuss experiences, work progress and current projects to see what could be of interest to them. They spot market-opportunities and inform each other on upcoming seminars or meetings. The initiator of the network still participates in meetings, but his organising role is taken over by one of the 'young geohydrologists' of the organisation.

Box 1

Community **"G.O. science"** (*GeoDelft, Geotechniek, veiligheid-gerelateerd*)

Within the G.O.-company active in the field of geo-engineering, and more specific 'safety and risk analysis', a group of colleagues helps each other with their consulting tasks. Mostly they can handle assignments on their own, using standard rules and standard calculations. In some cases however only when they cannot solve problems in their own projects they contact a colleague for help. The colleagues consider themselves as a group

or at least a network, but they do not have organised meetings. The group consists of ten to twenty people, who meet each other individually, but informally and hardly ever as a group.
The company recently installed a new Intranet, which could be useful for this network of colleagues, but it is not really successful yet. Especially because planned activities on the system, such as uploading projectplans and -reports, were either unclear or malfunctioning from start, some people have already become disappointed in the system and had lost interest in using it. Currently, some documents are put on the system because it is required, but hardly any other use is made of it.
The respondent has considered organising some plenary sessions, but he expects no or very few attendees, i.e. only those with an actual problem or issue. Besides this, the company is small enough to know who is working on what and who knows more about a certain topic.

Box 2

The communities above are formed around particular professional disciplines and can be helpful to improve communication between distributed colleagues. Another example of an internal community is given in box 3. It describes a group of young, new employees in one organisation. Although they do not necessarily share the same professional discipline or background, they do have the topic of 'freshmen' in common.

Community **"G.O. freshmen"** (*GeoDelft, Jong GD*)

According to our respondent this community of young geo scientists in G.O. was formed approximately four years ago in the same period as the new director entered the institute. It is unclear, who took the lead in the formation of this community, but most of the actions undertaken by the community were bottom up and pampered by the management, especially by this new director.
The 'raison d'être' of 'G.O. freshmen' can primarily be found in their guidance-function for new (young) employees entering the organisation. Various activities, ranging from social events to professional briefings, were initiated. The active role the young employees took in this initiating process is remarkable. Also remarkable is the awareness and supportive attitude of the management towards these initiatives. This may be caused by its positive additional role: the community establishes connections between different employees working in different departments of the institute and in this way, it integrates knowledge (content knowledge as well as social network knowledge). In supporting this community, the organisation practices what it preaches: in becoming a 'networked organisation' it starts 'at home', in the organisation itself attention is paid to connecting people and sharing knowledge.
A third role of this community may be the role as 'informant' of the management. Generally speaking, young people, who are bringing in novel skills, have an open outlook towards the organisation and probably generate many new ideas which can become innovative developments as long as a certain amount of freedom is guaranteed.
As mentioned above, the institute has a positive attitude towards inter-organisational co-operation (or networked organisations). As data show this is also expressed in the way it supports secondments of her young employees to other related or partner institutes. Through this mechanism the institute can import knowledge from different sources or disciplines. The employees form linking pins between the organisational units. By bringing together these people in structures like the 'G.O. freshmen' the organisation enhances the chance of the diffusion of (new) knowledge. On the other hand, also other social relations like room-mates, mentors and 'spouses-working-in-the-same-organisations' play important roles in the construction of the knowledge network.

Box 3

Interorganisational national

Interorganisational, national, communities are composed of people who share their practice but work in different organisations in the same country. These communities may resemble networks, or 'professional associations' in which colleagues in a certain field share and develop knowledge (see box 4)

Community **"Hydrolumni"** (*NHV*)

"Hydrolumni" is the community for hydrologists in The Netherlands. It consists of 750 members who, in some way, either by study or work, are involved in hydrology. Because people from the whole country participate, it is possible to find 'new knowledge' here. These new developments and innovations are interesting for many members, especially the 'real hydro-freaks', as our respondent says. Some of these 'fanatics' form a very small subgroup of five people who are 'possessed' by their work and have a true passion for it. They are continuously searching for new challenges. They form an active core that has become authoritative on the new developments.
The community organises meetings three times a year for all members around a certain professional topic. Presentations are usually given by members themselves. Our respondent not only attends the meetings to keep informed, but also for the joy of it, for it is great fun to take time to discuss content with peers, he says. Sometimes these are ex-colleagues, but they can also be 'freshmen'. 'Hydrolumni' not only organises meetings, but also publishes a magazine. This too is considered to be an important source of (new) information in the field of hydrology.

Box 4

The next box contains the description of an interorganisational national community that resembles a projectgroup or -network.

Community **"Sedimentation group"** (*AI Netwerk*)

The work in this community takes place within the context of a large co-operative project in the field of civil engineering. The focus of this recently formed group (just a half year running), is the development of a sedimentation model for the main port of Rotterdam. In this project, representatives of four out of the five partners from Delft Cluster are brought together to establish an ambitious project where a system can forecast the sedimentation of harbours. The total group has about 15 members.
Over the year, 4 plenary sessions have been planned. These are complemented with sessions of smaller subgroups. According to the respondent, weekly contacts between individual actors in this network are usual. These interactions are mainly established in face-to-face meetings, or by using phone and e-mail.
Although all participants are representatives from different, more or less competing, organisations co-operation seems to work out well after an initial phase of 'getting-to-know' each other. It seems that all participants in this project are aware now of the fact that the work done so far could not be achieved by one of the partners alone. Each party involved is a necessary participant. The volume of collected data is quite massive and will be shared freely among the participants.
While studying this work group, it becomes clear that also for participants c.q. respondents the borders between networks and project teams are fuzzy. Although the participants know that it is officially a project group they are working in, the perception that the group has network characteristics is obvious.
The intention of this group is to use the ICT groupware tool, provided by the cluster organisation, for the project work. Like in the G.O.-freshmen case, this respondent was young and enthusiastic about the tool and clearly saw the advantages of using this instrument. The idea was to upload the information coming from the subgroups into the system, in order to inform the full group about the activities and results. Our respondent even encouraged colleague project workers to use the tool by providing them shorthand documents of how to use the tool.

Box 5

While some communities, as shown in box 6 and box 7, can be quite formally organised, others, described in box 8 and box 9, are examples of more 'open' communities.

Community **"Coast-wise"** (*TAW, kust*)

After the disastrous floods in 1953 in the 70s a relatively small incident happened [a collapse of a dike caused a flood with one casualty]. This had spurned the then Dutch minister (of Public Works and Transportation) to prevent any such incidents to become a disastrous flood. So he established a Technical Advisory Committee of 20 people around the practice of protection of The Netherlands against flooding from sea or main rivers. This committee meets every two months. Its members are officially appointed and directly advise the minister. Four permanent workgroups perform projects (and work) for the advisory committee. These workgroups each create knowledge that can inform the advisory committee on specific matters. Only after approval of their results it will

be included in the official advice of the advisory committee to the minister. One of such workgroups is the "Coast-wise" community.
'Coast-wise' consists of 14 to 15 people that meet at least 5 times a year. Topics of research are carried out by engineering consulting firms, Waterboards and State authorities and research institutes or universities in The Netherlands that are involved in coastal research. They are asked to write research proposals and explore the unknown facts and figures of the coastal practice. A few members of 'Coast-wise' are appointed to guide the research project on a more regular basis. Topics mainly concentrate on safety issues in the coastal zone (and recently also environmental and management or control issues), in order to have enough knowledge to be able to prevent incidents. Examples of issues are the following: are the dunes strong enough and how much sand is eroded in storms. Although participation is voluntary and projects receive a 'subsidy', members should be asked (appointed) through official letters. The members are usually people 'renowned' for their excellent performance or knowledge and are highly experts in their field. Thus, 'Coast-wise' normally does not consist of 'rookies' or young researchers. So, all of the members probably already knew each other before entering this network/co-operation. It has many similarities with an 'old boys network'. And although you only can become a member through invitation by official letters, these official letters are send to people already known by members of the network. This network is considered important as well for knowledge processes.

Box 6

Community **" Safety advisors"** (*TAW, veiligheid*)

"Safety advisors" is a workgroup for the same Avisory Committee of box 6. This community on safety concerns the risk-analysis of dikes and embankments in The Netherlands. 'Safety advisors' was founded in 1979 and during its existence the group broadened its focus. At the moment the group is not only focusing on the influence of water on dike stability but also on soil mechanics and other aspects which are important for this topic. The group has about 12 members, all representatives of different institutes and companies active in this area. Because it is a network constituted by an Advisory Committee for the state, a balanced mix of people from different institutes and companies is demanded. The mentioned broadening of the focus of the group also resulted in the adding of some more practical oriented people. Once a year the chairman has to write a report about the activities of the group for the Advisory Committee. The members meet every two months, but meet each other also in the different projects which are, since the nineties, initiated by the network and executed by a subgroup of the network. These subgroups are called project groups and the network decides upon things like who is joining, what is the budget and what will be the way of working etc. Within these constraints a project group acts independently. Because of the existence of these project groups members meet each other far more often than twice a month.

Box 7

Community **"Risk analists"** (*probabilistics*)

Members if this community are people and organisations that are working in the field of (probabilistic) risk analysis and reliability in a broad variety of disciplines, such as civil engineering or industrial engineering. In this large network of around 270 people, the regular meetings are every three to four months. In these meetings several members give a presentation about a certain topic, which is related to application of probabilistic reliability or risk analysis (or decision support). According to our respondent these meetings are important to stay up-to-date in this domain. Visiting the meetings enhances knowing what other people are working on and what is new in the discipline. Some members only visit these meetings because of this keeping up-to-date. Others, who may even not be working in the discipline of application of probabilistic reliability or risk analysis need some info about it for their own projects. One could say that these members are more in the periphery of the network, compared to the experts in this practice. Besides the regular meetings, some members meet and work together on certain projectgroups .

Box 8

Community **"Coast inc"** (*NCK*)

In 1991 a group of initially four (later expanded to seven) Dutch organisations, all involved in the practice of coastal research, decided to strengthen their knowledge, position and opportunities in this field by cooperation.

This cooperation was stimulated by common need to draw the attention of the government (and other external parties of interest or subsidy suppliers) to this kind of research (especially in the long-term). So, the organisations had to co-operate in order to be a strong unity (act as one voice) and thus they initiated the knowledge network or community "Coast inc".
Their goals are to stay leading (authoritative) in coastal research and stay on the (political) agenda, as well as to expand the knowledge on coastal zones and processes in order to manage them (especially in densely populated areas). The network has an important platform function: researchers co-ordinate, co-operate and know how to find each other. This includes recognition and visibility among external parties. Furthermore, actual co-ordination of research in all of the involved organisations is important as well. Individual participation is voluntary (in the sense that it pays no salary), which causes the memberlist to be quite dynamic. Everyone working for a participating organisation and interested in coastal research, can participate. Some people are member of a permanent group of experts, others such as PhD students, are involved only on a temporary basis.
A group of approximately 70 people (25 staff members from the participating institutes and 45 PhD students) organises meetings and discusses each other's work and plans. The Programme Committee co-ordinates amongst others the set-up of research proposals and programmes. Research plans for the European Commision, for instance, are necessarily submitted by a consortium of several organisations. 'Coast inc' provides the participants with a network to find people with whom one can write, submit and perform such European projects. Because coastal research is a broad theme, the network has several (4-6) subgroups or workgroups. Some of these workgroups have their own meetings and perform their own 'projects', on top of the plenary meetings. On these plenary meetings ("Edges"), which last at least two days, members can attend over 30 presentations by researchers. The attendance-rate of these face-to-face meetings is quite high. The 'Edges' are especially organised for researchers to discuss their work and meet (get to know) each other. This enables them to find each other more easily in the future, which often develops into rather tight co-operations in projects. The 'Edges' are hosted by one of the participating organisations, usually once a year.
In The Netherlands the group of researchers in the practice of coastal research is not very large, approximately 100-150 people, distributed over 10-12 organisations (institutes, universities and engineering (consulting) firms). Thus, in general it does not seem difficult anyway to be able to find peers around this rather focused practice. 'Coast inc' however, is considered a great help.
Summarising, the network appears to be very important for the following reasons. In the first place, through it participants are kept up to date on (Dutch) research in this field, so they keep up with the latest developments and innovations. Secondly, it provides a network of important peers, who are necessary to perform good research. Thirdly, this subsequently provides them visibility. Thus, they perform as one group that has a clear 'face' to external parties, such as governments or researchers from abroad.

Box 9

Interorganisational international

Box 10 and box 11 describe two cases of communities with members who are not only organisationally but also internationally distributed .

Community **"River lifes"** (*Bangladesh SWMC*)

This community is an international collection of scientists working in the field of civil engineering within the expertise of river morphology. River morphology concerns the knowledge of the 'behaviour' and shape of natural river systems. In this case the river system of the Brahmaputra and the Ganges, coming together in a river-basin in Bangladesh, is the object of study of this community.
The morphologists meet each other and work with each other, for different projects concerning this river, in different constellations. For each project a new project group or network is established. But the different members come from a relative stable and limited number of institutions like universities, research centres and consultancy organisations in the field of civil engineering.
The institutional interconnections (meso level) are transformed into relations on actor level (micro level) e.g in this project work. The data support the idea that the morphologists themselves steer the way in which they want to develop / continue their actor-knowledge-network, within the solid frames of inter-organisational co-operations like e.g. scientific programs, consortia, projects, clusters etc. Driven by a problem situation, a factual co-operation, curiosity, studiousness and a good deal of opportunism, the social-knowledge-network is maintained, embanked or enlarged.

When our respondent, the river-morphologist, describes his career from student via PhD student to (senior) expert the story becomes more and more filled up with institutions and actors which remain relevant for his practise. Clearly observable are the switches the actor makes between institutions in the field of expertise, the plural work relations with these different institutions, but above all the constant relations among actors from prior work situations, like projects, spread out over these core institutions. This can be regarded as the kernel around which continuity of expert communities is safe guarded and processes of knowledge exchange take place. The description of the career of the expert also makes clear the role-changes that take place.
In the beginning the respondent as a junior expert was coached by others, while in later years he became a coach himself. The community of river-morphologists is based upon a very intertwined international network of co-operating institutions and organisations spread out over different institutions like government, semi-government, non-profit organisations and profit organisations. Time-after-time new temporary configurations are formed from the 'core group' in order to co-operate in certain projects. Distribution of state capital can be regarded as an external stimulus for the 'core group' to form new configurations.
The data do not show strong indications for the use of ICT-tools supporting the community building process for the river-morphologists. The community is mainly build upon interpersonal contacts. The most basic digital support for the community is simple e-mail .

Box 10

Community **"Joint safety"** (*Joint committee on structural safety)*

In the seventies the idea of standardisation of safety analysis arose. Different parties from all over the world gathered in a joint committee on structural safety. The network nowadays consists of approximately twenty people from Germany, England, France, Denmark, Japan and America, but mainly from Europe. Most of the members work at universities and all of them are experts in the field. New members are invited by current members to join. The group has set itself the task to formulate guidelines for the analysis of structural safety.
A core group of about ten people meet twice a year (often connected to a relevant conference) to discuss ongoing issues. The meetings have both informal and formal parts. The chairman of the network and his secretary prepare an agenda for the meeting. Most items concern agreements on deliverables of one or more members. The progress is checked and sometimes there is a discussion on content. These discussions are, most of the time, very intensive. Members of the group are highly qualified experts and really like to discuss practice related issues in the smallest details. Therefore these meetings are experienced as joyful by the respondent, who states that it is not that often that one can have such intensive discussions with other experts, with peers, in the field. Moreover, the meetings give him the possibility to check with peers whether he still keeps pace. Sometimes a subgroup meets in preparation of a common paper. The intention is to deliver the papers as a group, therefore they are thoroughly discussed in the meetings. Subgroups of two or three members who have to prepare papers, use e-mail to distribute their contributions to the other members of the network. But since recently the network has its own Internet site with the possibility to upload documents. It is not clear yet whether this is going to work, so, whether the Internet site really will be used.
For the respondent the meetings are an important source of information. They help him to keep up-to-date in the field. He is informed about new developments and picks up ideas, or suggestions for further research.

Box 11

Appendix E. Results of telephone interviews

The purpose of the telephone interviews was to list commonalities of several communities, such as the goal of the community, the number of members and how successfull it is. But from the telephone interviews again it appeared that the term community was interpreted in very diverse ways in DC. Respondents –in the KnowMe survey- appeared to have mainly given names of project teams, departments, advisory boards and steering committees. These groups do not refer to the concept of a community as we define it. Therefore, the questions we had formulated in advance did not well match the groups discussed, as we were searching for new ways of working. But we learned some interesting things about knowledge sharing in this field.

As a result, again it appeared that the term was interpreted in a very diverse way. Respondents had given names of project teams, departments and advisory boards. Sometimes, the project groups formally spoken of were indeed project groups, with an assignment and a deadline. Once the deadline was reached and the goal achieved, the group would be dissolved. In practice these project groups functioned more like a subgroup of a network of researchers, with an ongoing process of attaining assignments (and deadlines) rather than a finite project group. As in project groups, the group was dissolved, once the product was delivered. In most cases however, an invitation for a new, follow-up group would follow.

We also asked how the respondents stayed in contact with other group members. In the groups discussed the respondents mainly had contact by e-mail, sometimes telephone was used. Hardly ever more sophisticated ICT platforms were used to collaborate within the groups. The number of face to face meetings varied from once a year to once in six weeks. At least once a year most of them would meet at a conference, for instance.

The respondents often talked about a (mostly international) personal network of researchers, or, as one could say, colleagues in the field. They communicate with these other researchers mainly via e-mail and meet at conferences or similar activities. These networks are very important for them to stay up-to-date and to initiate new research. One respondent for example illustrated this by saying that the network was not a network of knowledge but a network of acquintances via whom acces to important kowledge and information is guaranteed. The network informs them about activities and new developments at other institutes and possible research directions in the field. Delft Cluster, therefore, is in this context regarded as one of the networks people are active in, not as *the* main network in their field.

Appendix F. Analysis of survey data for Theme 6 and NCK

The Community Assessment Tool (CAT) was developed by our research group at Delft University of Technology. It has been specifically designed to assess group functioning and perceived utility and success, as well as the processes by which knowledge is shared by communities. We have used and will use the CAT in various communities and groups in international settings. All is done in the context of a large-scale comparative research.

Within Delft Cluster we have distributed the questionnaire to NHP, NCK and Theme 6, in the context of our project Knowledge Sharing in DC Communities of Practice. From NHP however, no form was completed and returned at all (except from the facilitator), so this group will not be analysed below. Further, it should be noticed that NCK is not the same as Coastal Researchers, although overlaps exist.

We have promised NCK and Theme 6 to provide results of the questionnaires, as these will be given here. However, we are unable to advise these groups or DC as a whole, because of the tentative nature of conclusions. This is based on the fact that only a very limited number of completed forms were returned and could be used. Due to these small numbers the representative ability and the reliability are highly limited. This must be realised when reading the analysis below.

Return rates

The table below (Table 1) shows the return rates from the two groups.

Group	Questionnaires distributed	Questionnaires returned (useful)	% return rate
Theme 6	18	4	22%
NCK	80	17	21%

Table 1. Return rates of questionnaire

As return rates are rather small, 22% for Theme 6 and 21% for NCK, any conclusions are tentative at best. From NCK we have received a total of 18 questionnaires, of which we could only use 17. For Theme 6 we have had 7 questionnaires returned in total, but only 4 could be used, as the others were completed for a different type of group than Theme 6. This means for instance that if 50% of the respondents agree on something, this in fact means only two people from Theme 6 as a whole. And because we do not know why not all people have completed the questionnaire, we do not know if the four respondents are representative for Theme 6. Therefore, any conclusion should be considered in this light.

The basic demographics of the respondents are presented in table 2 below. For each, the mean (*gemiddelde*) and range (*uiterste waarden*) are given. Both groups mainly consist of males (Theme 6 100% and NCK 88.2%) in their fourties. People in Theme 6 overall appeared to have a larger experience in their field and were also employed a little longer. NCK participants on the other hand have been a group member for a longer time, which relates to the length of the existence of the groups: Theme 6 started approximately 3 years ago and NCK is 10 years old.

Demographics	*Theme 6*	*NCK*
Age	Mean = 40.9 years; Range 27 – 63 years	Mean = 44.5 years; Range 28 – 52 years
Experience	Mean = 19 years; Range 5 – 29 years	Mean = 13.7 years; Range 2 – 32 years
Time employed by company	Mean = 16.3 years; Range 2.5 – 27 years	Mean = 11.6 years; Range 2 – 36 years
Sex	100% male	88.2% male; 11.8% female
Time member of the group	Mean = 27.5 months; Range 18 – 36 months	Mean = 77.7 months; Range 5 - 120 months

Table 2. Basic demographics of respondents

Type of membership

Respondents were asked whether there was an active core group or if all members participated equally. The results for both companies are shown in the table below (Table 3).

Type of membership	*Theme 6*	*NCK*
There is an active core group	75%	64.7%
Most members participate actively	25%	35.3%

Table 3. Type of membership

The majority of people from both groups indicate that the group consists of both an active core and a less active group of participants. For Theme 6, 75% stated this, and 64.7% of NCK members. In both groups this idea was shared by the facilitators.

In order to determine the position of the individual respondents within their group, they were asked to state whether they were part of the active core group, or one of the less participating members. In both groups about half of the respondents considered themselves as active members. In particular many ‘senior’ members and facilitators seem to consider themselves as active members.

Competition

Often people from many organisations participated in the communities. In order to see whether respondents considered the other participating organisations in the group a competitor of their own, they were asked for it. The results are shown in Table 4 below.

Are the other organisations competitors	*Theme 6*	*NCK*
Yes and Some of them	75%	40%

No	25%	60%

Table 4. Competitive organisations

Important goals for members personally

Respondents were asked which of the list of 13 possible personal goals were the most important for them personally. A maximum of five goals could be selected. These choices are shown in Figure 1 below.

In both groups, knowledge sharing was mentioned as the most important personal goal. The groups differed in the sense that for NCK members, networking was the second important function of the group. While Theme 6 respondents considered developing knowledge and new capabilities as very important.

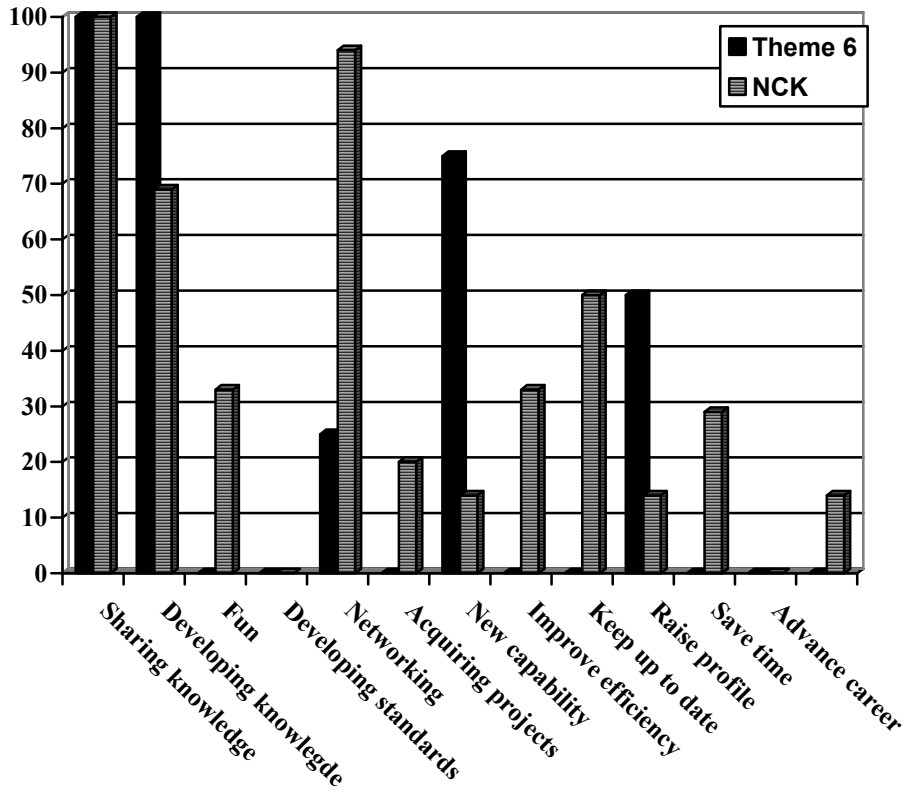

Figure 1. Personal goals for group members

Average time spent on the group

Many group members devoted quite some hours to their group. The mean number of hours spent on Theme 6 and NCK did not differ that much, respectively 17.25 hours and 16.5 hours per month, within a range of 1 and 100 hours.

Activities that take place at the group meetings

Both groups indicated to have meetings in which at least part of the members participated. The activities that take place at the meetings are central for facilitating knowledge sharing and exchange of experiences. Respondents were asked to select as many activities that take place often at their meetings from a list of 11 activities. They could choose between often, seldom or never.

Both groups appeared to have meetings with discussions and presentations. Excursions for instance were seldomly undertaken.

Activities	Often	
	Theme 6	***NCK***
Meetings with discussion	100%	65%
Talks about experiences	25%	47%
Presentations by members	50%	77%
Presentations by non-members	25%	5.9%
Workshops or brainstorming	50%	23.5%
Excursions	0%	17%
Writing publications	50%	53%
Doing concrete projects	75%	41%
Tendering for new work	25%	35%
Lobbying with influential partners	0%	24%
Other	0%	0%

Table 5. Activities that take place often (by % of the respondents)

Activities that are felt to be important

Respondents were then asked which type of activities they found to be important for them personally. These are shown in Table 6 below:

Activities	% who think activities are important ***Theme 6***	% who think activities are important ***NCK***
Meetings with discussion	100%	88%
Talks about experiences	50%	47%

Presentations by members	25%	88%
Presentations by non-members	0%	35%
Workshops or brainstorming	50%	35%
Excursions	0%	24%
Writing publications	50%	24%
Doing concrete projects	50%	35%
Tendering for new work	25%	18%
Lobbying with influential partners	25%	12%
Other	0%	0%

Table 6. Percent of respondents who feel activities of the group are important

As can be noted from the above table, the most important activities in Theme 6 were meetings with discussions, talks about experiences, workshops or brainstorming, writing publications and doing concrete projects. In NCK the top three most important activities proved to be meetings with discussions, talks about experiences and presentations by members.

Description of the meetings

Respondents were asked to describe the meetings by their agreement on a Likert scale for the following three adjectives: business like, social and useful. Responses are shown in Table 7 below.

Description of meetings	Agree	
	Theme 6	***NCK***
Business like	75%	47%
Social	50%	83%
Useful	50%	94%

Table 7. Description of the meetings

Both in Theme 6 and NCK most people indicated that the atmosphere in the meetings could be described as business like, as well as social. This is very interesting to see. This suggests that individuals are comfortable with each other and at the same time, ensure the meetings run smoothley, and business is conducted in a social atmosphere. No one found the meetings completely unuseful. In NCK in particular, the meetings were considered useful.

Role of the co-ordinator

The role of a co-ordinator is often central to the success of a group. Seven possible tasks that can be undertaken by co-ordinators were provided and respondents were asked to select the ones that their co-ordinator was particularly active in. These are shown in Table 8 below.

Of NCK respondents, 94% say the group has a formal co-ordinator. The mean number of activities performed by the co-ordinator according to the respondents is 4. Of Theme 6, 75% say the group has a formal co-ordinator. It must be mentioned that these are only three people, which is a very small number to base concrete conclusions on.

Activity co-ordinator is particularly active in	*Theme 6*	*NCK*
Organise meetings	50%	71%
Stimulate members to participate	50%	53%
Sharing his/her own experiences with the group	0%	0%
Co-ordinating intranet acitivites	50%	88%
Making external contacts	25%	53%
Connecting the group members with each other	25%	47%
Promoting the group towards management	75%	30%

Table 8. Roles of the co-ordinator as perceived by members

For NCK the results show that the group facilitator is perceived as being most active in organising meetings and co-ordinating the Intranet. Although these are important for the success of the group, there is room for improvement in terms of promoting the group towards management. And both in NCK and Theme 6 it may be wise for co-ordinators to share their own experiences with the group. This latter is an excellent way to stimulate knowledge sharing and exchange, and facilitators may consider introducing this element into their meetings. Contrary to NCK, promoting the group towards management in Theme 6 is perceived as an important activity of the co-ordinators.

Mentors

All of the respondents from Theme 6 say experienced members do NOT act as mentors. 47% of NCK say more experienced members do act as mentors. Thus, in Theme 6 and to a lesser extent in NCK there is room for improvement in using senior people as mentor for newcomers in the group. This is often considered an important way of knowledge sharing, which now seems still underutilised.

ICT availability

Group members were asked which of 11 ICT tools they had access to. The results are shown in Figure 2. Both groups also meet face to face and for these groups ICT does not play a central role. However, they both have several (common) tools available, such as email, fax, phone and Internet. More sophisticated tools, such as video conferencing or a knowledge repository, were said not to be available at the time of the survey.

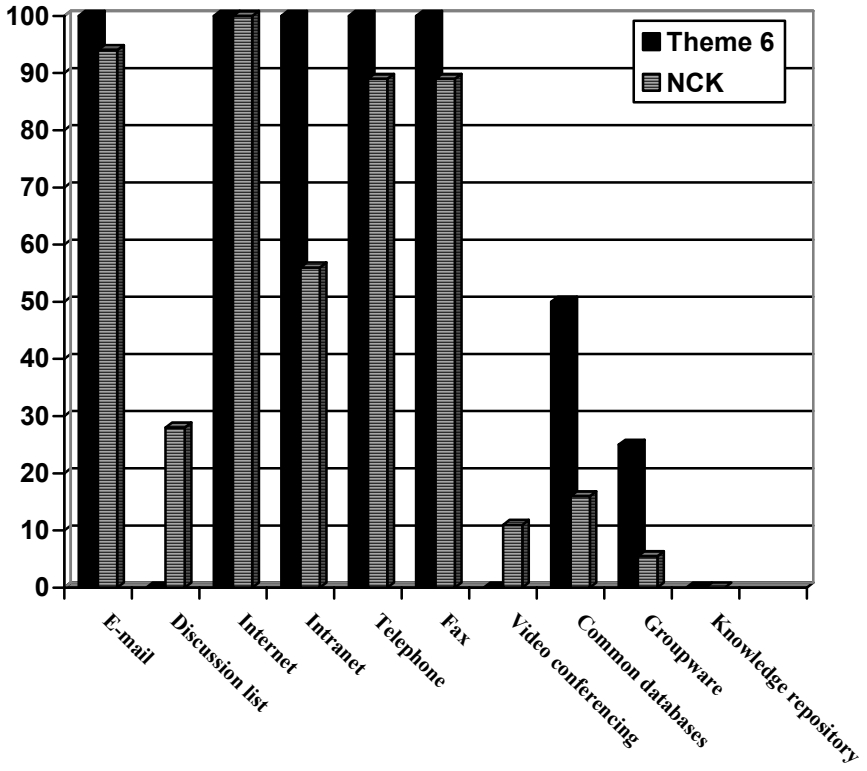

Figure 2. ICT tools available to % of group members

Respondents were also asked which ICT tools they would like to have that are not currently available and that would be useful to them. The results are shown in Figure 3 below.

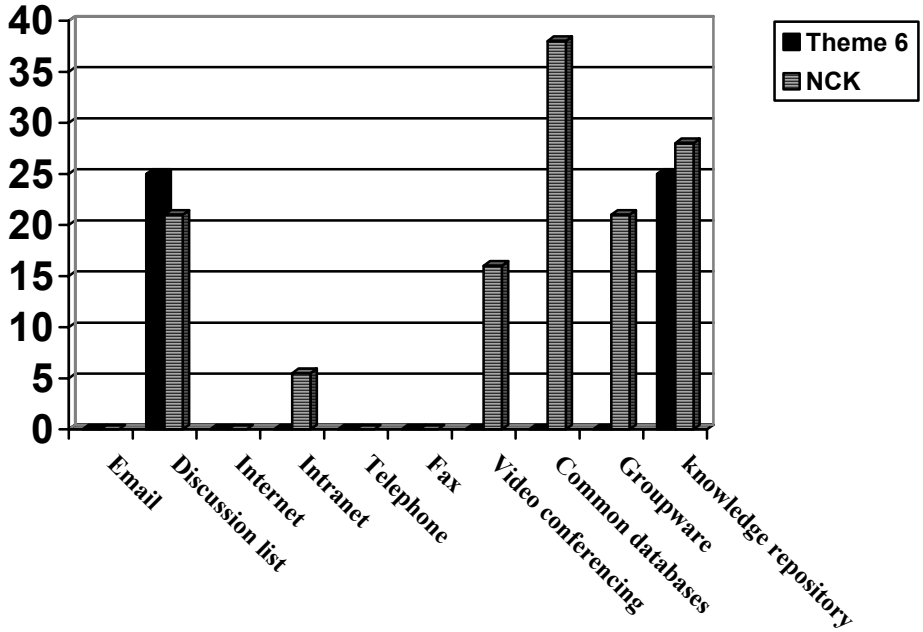

Figure 3. Percentage that would like currently unavailable ICT tools

It appears that some people (in particular in NCK) seem to consider all of the tools that are not available to them as (very) helpful. In particular they think common databases are useful. However, it must be mentioned that only a very small number of people have answered the question.

However, although people consider certain tools -still unavailable to them- as useful, there is no guarantee that availability will improve the success of the group (or even the actual use of the tools).

Organisational influence on participation

Groupmembers were asked whether they felt encouraged or hindered by their respective companies to participate in their group. 50% of the respondents of Theme 6 feel somewhat encouraged and 50% feel neither encouraged nor hindered by the company. In NCK 47% feel very encouraged; 18% feel somewhat encouraged and 35% feel neither encouraged nor hindered.

Group dynamics and outcomes

The final set of questions analysed here related to the perceptions of the group dynamics. These questions and the number of respondents (with percentages in brackets) are shown in the table below.

Question	Agree	
	Theme 6	***NCK***
Trust, cohesion and identity		
The members of the group trust each other	50%	100%
The members of the group feel a sense of loyalty to the group	25%	82%
The group has developed a shared language and understanding		76%
The members of the group feel a sense of belonging to the group	25%	53%
There is a sense of real friendship in the group	25%	41%
Knowledge sharing and learning		
Some members are reluctant to share their knowledge with other members		24%
The members of this group are generally very enthusiastic and motivated to participate	25%	6%
Contribution to the organisation		

This group enjoys a high status in the organisation	25%	47%
This group contributes many new ideas to the organisation	25%	53%
This group has directly contributed to a large cost saving for the company		12%
This group has a real contribution to the effectiveness of the organisation		35%
Personal benefits		
Being part of this group enables me to work more efficiently	25%	41%
Through being a member of this group I have been able to solve problems in my work	25%	41%
Through being a member of this group I have learned a lot about my specific subject area	50%	88%
Through being a member of this group I have found new customers/ projects	50%	24%
Through being a member of this group I have made many useful/ new contacts	50%	94%
Through being a member of this group my career prospects have become better		18%
Overall evaluation		
In general I like working in the group	75%	94%

Table 9. Level of agreement with statements about the group

As can be seen from the table above, in terms of trust, cohesion and identity, NCK generally scores higher than Theme 6.

A few (24%) of NCK respondents feel that some of their colleagues are reluctant to share their knowledge. It is important for the group leader and the members to determine where this perception comes from and if it is accurate – if members are reluctant to share knowledge then it is important to determine what hinders them from doing so.

As regards contribution to the organisation, it can be seen that the Theme 6 members do not perceive that they have positively contributed to the organisation. The respondents from NCK do not perceive a direct financial or effectiveness contribution, but many do perceive that they contribute to new ideas.

There are few differences between NCK and Theme 6 regarding solving problems, working more efficiently and learning about their subject area. The fact that in both cases only around one third of members feel that being part of the group has enabled them to solve work-related

problems and to work more efficiently is a cause for some concern. However, almost 90% of NCK feel that they have learned a lot about their subject area by being a member of the group – so there are some positive aspects relating to knowledge sharing.

The personal benefits of advancing in their career was perceived by only 18% of the NCK members whereas making new contacts was seen as a positive benefit by 94% of the members. Theme 6 respondents on the other hand, do not regard their participation in the group as having an effect upon their career at all, while 50% feel that they have made beneficial contacts via the group. 50% of Theme 6 and 24% of NCK feel they have found new customers or projects by participating in the group.

For both groups, members generally like working in the group. In general, the respondents are fairly positive about their groups, although improvement could always be made in terms of willingness to share knowledge.

Appendix G. Scientific paper.

Derived from Soekijad, M. and M. A. A. Huis in 't Veld (2002)- Knowledge sharing communities IN practice, in: Andriessen, J. H. E., Soekijad, M. & H. van der Horst-Keasberry (eds.) - S*upport for knowledge sharing in communities*, (pp. 35-56). Delft University Press (DUP Science), Delft.

2. Knowledge sharing communities IN practice

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Abstract

Communities of practice can be considered as long-term oriented groups whose purpose is to exchange, acquire and create knowledge around a certain practice, i.e., a skill, topic or professional discipline. The groups consist of individuals who have a shared identity, but might be (partly) geographically distributed. In this paper we specifically focus on knowledge sharing communities, of which members come from different organisations in The Netherlands. Our goal is to present insights in dynamics of inter-organisational knowledge sharing communities and to develop some first guidelines for the design and maintenance of technological and organisational support. We primarily use case study material from 'Delta', which is a network organisation of knowledge workers in the field of prospects for sustainable development of densely populated delta areas.

Based on experiences from practice we have developed a framework that includes a 'typology' of communities, which is based on two dimensions. On one dimension the main activities and goal of a community can vary from being primarily focused on exchange of existing knowledge, to being primarily focused on development of new knowledge (in the innovative sense). The other dimension refers to the visibility of communities: it distinguishes a community with a high visibility, representing a group that is rather formal and stable in name and practice (content), from a community with a low visibility. The latter is a 'permanent' network of individuals in a certain practice, which manifests itself in

various contexts (types of groups). The framework further includes some (preliminary) propositions considering the inter-organisational context and some technological conditions that support communities. The propositions specifically consider two challenges inter-organisational communities can meet: ICT support and the simultaneous competition and co-operation (co-opetition).

2.1 Introduction

Organisations have increasingly become more knowledge intensive and knowledge has become an (if not the only) important competitive asset for organisations (Prahalad & Hamel, 1990; Powell, 1998). Thus, for them, it is imperative to be able to find, have available, use and develop the necessary knowledge. Competitive organisations also feel this necessity (Khanna, Gulati & Nohria, 1998; McEvily & Zaheer, 1999). This inter-organisational co-operation, originating from the motivation of knowledge exchange and acquisition, can take place in several forms, such as in (knowledge sharing) communities for example (Botkin, 2000; Wenger, 1998; Brown & Duguid, 1991). A 'community' is a long-term oriented group whose purpose is to exchange, acquire and create knowledge around a certain practice, i.e. a skill, topic, or professional discipline (see also McDermott, 1999). The group consists of individuals who have a shared identity, but might be (partly) geographically distributed. Such groups (either intra- or inter-organisational) may form an essential element in network organisations and they can be leading concepts for organisational innovation. In this paper we focus in particular on knowledge sharing communities in an inter-organisational context.

Communities differ from project teams in that these latter often have as their main purpose to accomplish a specific task, instead of the (long-term) development of capability, through the exchange, acquisition and creation of knowledge (Wenger & Snyder, 2000). A community is not primarily about a product, function or task, but rather centres on a specific practice or knowledge domain. Brown and Duguid (2001) therefore suggest trying to *"look at knowledge and organisation through the prism of practice the way in which work gets done"*. Focusing on the practice, 'peers' are held together by a *"common sense of purpose and a real need to know what each other knows"* (Brown & Gray, 1998).

However, as mentioned above, although all communities have certain characteristics in common, they do have various appearances. In this paper we try to define dimensions along

which different inter-organisational communities can be distinguished. This (preliminary) 'typology' is illustrated with material from the Delta network, where we studied several cases. We use these data to develop and discuss a framework for such knowledge sharing communities as manifestations of inter-organisational co-operation. Our goal is to provide insights in the dynamics of knowledge sharing communities in an inter-organisational context, and to develop guidelines for the design and maintenance of technological and organisational support.

Communities composed of members that come from different (often geographically distributed) organisations can encounter at least two challenges: Firstly, simultaneously co-operation and competition (*co-opetition*) might become problematic. In studying the knowledge flows between people in communities who come from different, potentially competitive organisations, it is important to know what factors might influence the knowledge processes. Perhaps the competitiveness among the organisations is so strong that certain knowledge is not even shared at all. How can organisational support be given in such situations in which both co-operation and competition exist? And what factors influence the sharing and creation of knowledge, either positively or negatively?

Secondly, instead of, or at least as an addition to face-to-face meetings, knowledge sharing communities can be supported by ICT tools. But the question might arise: what kinds of tools are suitable for such groups? Which processes in the group can be supported or successfully affected by using ICT? And what are important differences between groups when considering ICT support?

The paper starts with a short overview of Delta as our 'case organisation', after which it continues with the methodology for collecting data. Further, we analyse the data while presenting a (first) framework for knowledge sharing communities based upon our findings. Here we present a typology and we continue with an elaboration of two challenges these communities can meet.

2.2 Case organisation: Delta

Our findings are based on data from a study in Delta as a 'case organisation'. Delta is a consortium of five knowledge institutes in Delft that focuses on research into prospects for

sustainable development of densely populated delta areas. This network was formally established in 1999 and is sponsored by the Dutch government for at least four years (with a long-term plan of 12 years)[20].

Delta is structured around seven 'themes' (content-related topics of expertise in Delta, such as the Coast and River Theme). Each theme has defined several projects in which interested sector organisations[21] can participate. The projects need to contribute to the overall goal of Delta to strengthen its knowledge and position in the field of prospects for sustainable development of densely populated delta areas. Delta has the ambition to develop into an international renowned knowledge centre in the Civil and Hydraulic Engineering sector.

Thus, Delta is a knowledge intensive network organisation. As a whole, Delta has no previous experience with being a network organisation in which knowledge has to flow and be developed. The separate parties however, do have extensive experience with various knowledge processes, because their core business consists of such knowledge work. Although Delta as a whole functions as a project-organisation, a number of communities exist in addition to project groups.

2.3 Method and data collection

As a first step, data on communities in Delta were collected through document analysis. Several brochures, flyers, documents, such as project proposals and reports, but also websites and results from the 'KnowMe' project[22] were studied.

After this document analysis some orienting interviews were held with Delta researchers dealing with knowledge management issues, before we could plan the rest of the interviews. The goal was to get acquainted with the Delta organisation, the practice of Civil and

[20] This is done in the context of ICES-KIS programme funding: for stimulation of knowledge initiatives for the structural improvements of knowledge infrastructure in The Netherlands.
[21] These can be engineering or consulting bureaus, (semi-) government or other institutes.
[22] The KnowMe project was centered around a KnowMe survey (questionnaire) that was originally developed as a 'measurement instrument' for knowledge management in a particular organisation (>various moments of measurement can be compared in order to see changes and plan improvements). It was used and altered to be applied in Delta, as a virtual network organisation. This survey was held under Delta researchers (project leaders), and completed with some additional interviews in the KnowMe project. We used some 'raw data' from the survey as input for our research.

Hydraulic Engineering (or more specific, research into prospects for sustainable development of densely populated delta areas), and communities that existed in Delta.

One of the seven themes within Delta, the Knowledge Management Theme, had set up the KnowMe project in order to get an indication of the knowledge activities within the consortium. One of the questions asked in the KnowMe survey was whether the respondent was involved in any 'communities of practice'. If so, they were asked to fill in the size of the group, the subject (practice) of it, how it was related to Delta and whether it was a national or international group. We had the possibility to scan and use the answers of this survey. It appeared that 'communities' as a term was rather ambiguous: everyone used his/her own interpretation of the term. This led to a diverse list of networks, organisations and groups that respondents considered to be communities (or knowledge networks).

Despite the ambiguity of terminology, we used this list as an entrance to select respondents for in-depth interviews in this orienting phase. We decided to contact those people who participated in or facilitated several communities (that were not merely 'formal' organisations), and who included extra information on this item. We tried to select people from a range of institutes and themes within the Delta organisation. As far as possible[23], we have chosen both male (5) and female (1) respondents and senior (5) as well as less experienced (1) people. All of them (6 in total) were researchers in the field of Civil and Hydraulic Engineering. Of the seven people approached, six were immediately willing and ready to co-operate. They all received some information about the interview in advance.

The interviews were semi-structured and in-depth and they usually took one and a half hours. Most respondents discussed several communities. As a structure or guideline for doing the interviews we used a 'community quickscan'[24] (a checklist of items for providing an overview of a community) that we have developed (at our department, see also Andriessen e.a., 2001).

2.4 Results from practice: Framework of community typology

[23] With respect to this particular sector and the fact that only (Dutch-speaking) project leaders were selected or able to fill in the KnowMe survey.
[24] A newer version of this Community Assessment Tool currently used in large scale (international) comparative research in our group.

Some observations. We have selected and studied eleven groups in Delta with the characteristics of communities[25]. Three will be excluded here, because they are *intra*-organisational. In the interviews some time was spent on the past and on the (expected) future of the different communities. So although the data mainly present a 'snapshot' in time, we could also learn some valuable lessons about the development and dynamics of the communities. We have made several interesting observations concerning their characteristics and dynamics. In Delta we often saw overlapping memberships and 'latent networks', for example. Delta can further be described as a specific type of network organisation with characteristics from a regional cluster, a virtual organisation, and a knowledge intensive organisation.

We will explain these observations at more length below, illustrated with some quotes (these were translated from Dutch). After that, we will present a framework that consists of two dimensions, based on these eight communities at Delta. This is a first typology for knowledge sharing communities in an inter-organisational context. In the next section, we will propose some preliminary 'guidelines' for technological and organisational support of such communities.

New or existing knowledge. Delta is a specific organisation in the sense that all participating organisations are knowledge institutes. Thus, to a certain extent, these knowledge intensive organisations individually have (professional) experience with knowledge processes: both with sharing knowledge (in the sense of providing educational and consultancy services), and especially with knowledge development or creation (in research activities). The latter can particularly be found in joint research or development activities, while the former is specifically concerned with 'keeping each other informed' on specific developments.

These two main goals and activities can also be found in the communities studied. Of course, both activities take place in all communities to some extent. However, it appeared that communities could clearly be distinguished. On the one hand there are communities in

[25] We have chosen only to include those groups that had community characteristics, although respondents mentioned other types of groups as well.

which experiences, information and knowledge are exchanged in meetings or presentations, for example.

> *"Another very important aspect is that it is a way to hear and know what is going on elsewhere."*
> *"My role is mainly to be a listener: acquire knowledge (...) and stay op to date."*
> *"We exchange experiences."*

Here, the focus is mainly to share and exchange existing knowledge that was previously created by separate groups, organisations or in projects for instance. Thus, these communities have existing knowledge as their main focus (of activity).

Other communities however, aim at developing new knowledge into the practice and primarily focussed their activities on actually doing joint research. Thus, members not only share (existing) knowledge, but also especially try to develop new knowledge together. This is sometimes done in the form of joint research:

> *"In the context of [this community] agreements are being made about the different parts of research."*

Most of the R&D related activities deal with complex and novel knowledge. Thus, these communities have new knowledge as their main focus (of activity).

Although both processes are interrelated, we have attempted to distinguish between communities that mainly have activities (or goals) that focus on sharing existing knowledge, and those that focus on the development of new knowledge. In literature it appears hard to find a similar distinction. Blackler (1995) for instance specifically refers to 'problem' instead of 'practice' in his typology for learning organisations (instead of communities). He distinguishes a focus on familiar problems from a focus on novel problems. Another relation might be found in March's (1991) distinction between exploitation and exploration. However, this dimension is based on the adaptation of organisations to their environment. In his view, organisations on the one hand might exploit old certainties, or on the other hand focus on the exploration of new knowledge and possibilities.

Thus, as an observation from Delta we have found that knowledge sharing communities can either focus their main activities around the exchange of existing knowledge, or particularly

around the development of new knowledge. Depending which of these two foci a community has it might require a different type of organisational or technological support.

Visible or 'invisible' communities. The communities in Delta appeared to be distinguishable along another dimension as well. On the one hand, several formal knowledge sharing 'networks', or communities were important for people and for their work. These communities often have regular meetings, formalised memberships and contact persons, and a 'visible' organisation or existence, for example. Members mainly use these communities to keep up to date and stay in touch with their 'colleagues', but also for more innovative knowledge processes. In other cases however, communities in Delta were highly informal, 'invisible' groups that seldom meet in the context of the (formal) community as such. Their members mostly meet while working in projects or other types of (formal) groups, but they have a shared identity towards and interest in the practice of a less visible community. So, the existence of these communities can be characterised as being 'latent' and becoming active when the right situation or context occurs (an incident, a question or need, or an opportunity to develop a common project etc.). In such cases the 'right' people (money suppliers etc.) can be contacted in a short time. This is illustrated by the following remarks.

> *"Together we make a rolling train, we know how to find each other very well."*
> *"Well, it works partly because you know the people, and thus can 'pass the ball' very quickly."*
> *"Yes, there is no doubt about that: When dividing money [sponsorships] and writing mutual project [proposals], we know how and where to find each other."*

It is like the network described by one of the respondents. According to this person, he knows his network of peers very well (and the others in his network also know each other very well) and he does not need an 'active', or visible community. His community or network is a relatively stable formation of a core of people, who meet at conferences or in an advisory board or in a project oriented group. Thus, these communities are less visible than, but at least as important as the more formal ones to keep up to date and stay in touch with colleagues and also to develop new knowledge.

The participation of members of such a latent community in various types of other (formal) groups can be considered as overlapping memberships. In Delta new configurations

continuously develop within the network of organisations, which are all active in this knowledge area (e.g., government institutions, semi-government institutions and private organisations). As mentioned, these different configurations might for instance be project teams, advisory boards, or other, more community-like, groups.

> *"In general they are all the same people: Sometimes wearing this hat, other times wearing another one."*
> *"If it does not take place in the one context, it will happen in another: just put it in a Delta-folder and 'it's Delta-work'."*

In some cases there are also examples of employees working for two companies, which enables them to form cross-links between these organisations.

> *"As a knowledge institute they would like to propagate that they support knowledge generation. Therefore, they think it is important that their employees have the opportunity to do a PhD study."*
> *"They also intended to co-operate more, and this led to its establishment."*

These people can function as a 'linking pin' or broker between various networks (see also Wenger, 1998). This relates to the strength of weak ties (Granovetter, 1973), or as Burt (1992) says: 'structural holes'[26].

Thus, the material from Delta indicates that on the one hand, knowledge sharing communities can have a 'visible' character and consist of people who only meet and know each other within the context of that particular group or community: while the practice, and thus the focus of the community remains the same, the members themselves can replace each other. While on the other hand communities can also exist as latent groups that are difficult to distinguish (as a more or less 'core network'). These communities are thus less visible, as they have no name or face, nor any formal label. Although both have the characteristics of knowledge sharing communities, as mentioned earlier, we have found less literature on the latent, less visible communities.
Both 'types' of communities have their own ways of working and therefore might have their own needs for organisational or technological support.

[26] Granovetter (1973) explores the strength of ties among individuals in a (social) network. He states that when a person has a frequent contact (or, a strong tie) with someone who has a lot of other contacts (with 'thirds' who do not have a direct link to that first person), this is valuable to that particular person. That link to others, through someone familiar, is considered a weak tie, because that linking person is the only 'bridge'. Burt (1992) refers to these mechanisms as structural holes, which is defined as the relationship of nonredundancy

Summarising, the data of the Delta cases so far have shown that knowledge sharing communities are sometimes not only difficult to distinguish from teams and project groups, but also from committees, research consortia, advisory boards and professional of informal networks. It seems that particularly in the world of research and development, people meet each other in all kinds of groupings that overlap in membership and are used for various purposes, of which knowledge processes are only one. In this research, we have only included those groups that have the characteristics of communities, as described in the introduction of this paper. From these, two general distinctive dimensions came up. The first dimension (of central knowledge activities) distinguishes a focus on existing knowledge from one that focuses on new knowledge. The other dimension (of visibility of the community) distinguishes a high visibility from a low visibility.

The eight communities in Delta formed the input for a first typology of interorganisational knowledge sharing communities. Figure 1 shows these eight communities along the two dimensions. In Appendix I the four 'gray-coloured' Delta communities from figure 1 are discussed in greater detail and serve as an illustration of the four types of communities.

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between two contacts. Players with networks optimised for structural holes enjoy higher rates of return on their investments because they know about, have a hand in, and exercise control over, more rewarding opportunities.

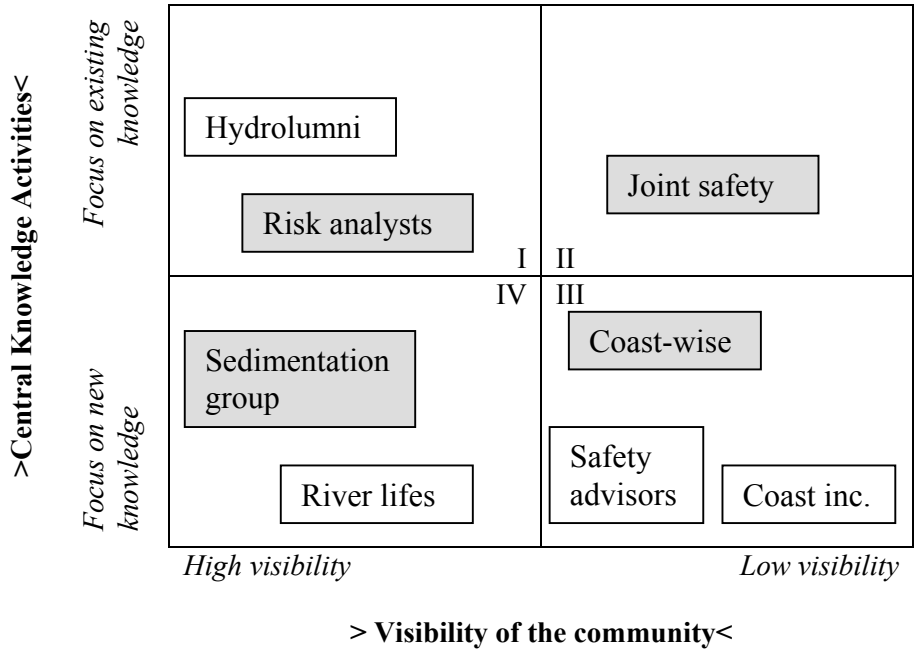

Figure 1: Communities in Delta

Figure 2 then shows the four types that could be discerned in (abstracted from) the Delta practice. The 'visible exchange community' has existing knowledge sharing as its main goal and activity. It is focused around a certain practice and is highly visible. While the 'invisible exchange community' also shares existing knowledge, it is a less visible group of people that form a certain core network. This latter is also applicable to the 'visible innovation community'. However, the members of this community tend to create new knowledge. The 'invisible innovation community' also creates new knowledge, but is more visible.

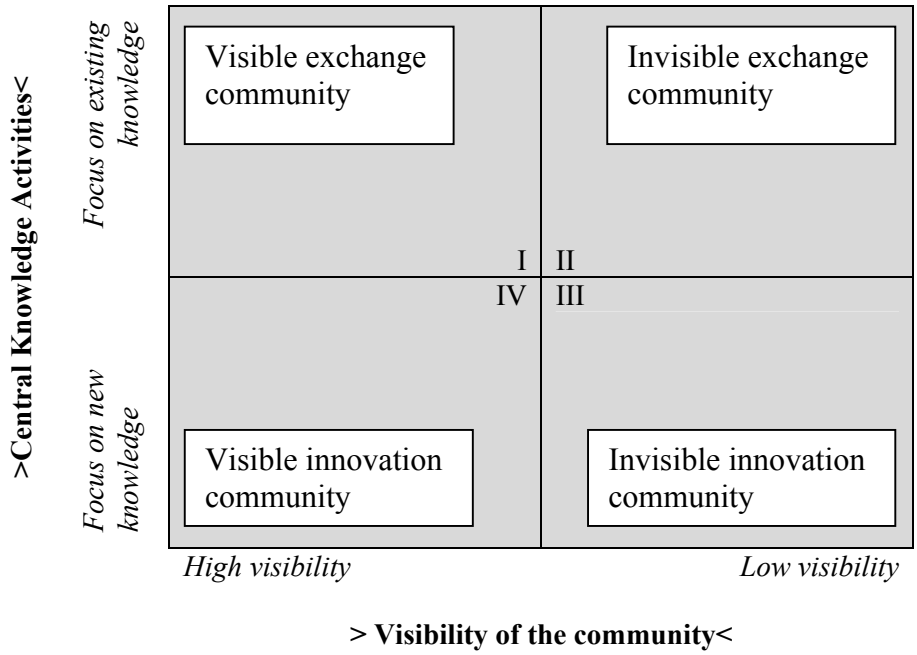

Figure 2: Community typology

2.5. Challenges in interorganisational communities

The above provides insight in the types of communities that can exist in interorganisational co-operation. In general, it should be mentioned that these two dimensions do not present a black-and-white typology, but more of a 'tendency' of communities to act in a certain manner. However, we believe that each of these 'types' asks for a distinct approach, in facilitation or support for instance, because each has its own characteristics and needs. In the remainder of this section we will therefore present guidelines for the design and maintenance of technological and organisational support. These will be related to propositions that can be studied in further research. We will do this along two 'challenges' that interorganisational knowledge sharing communities can meet, as mentioned in the introduction, respectively co-opetition and ICT.

Co-opetition. Firstly, interorganisational communities can encounter the challenge that knowledge sharing and creation are sensitive issues, because of the simultaneous, seemingly opposite processes of both co-operation and competition. Some have referred to this as *'co-opetition'* (Brandenburger & Nalebuff, 1996). While others have written about an 'interorganisational learning dilemma' (Larsson, Bengtsson, Henriksson & Sparks, 1998).

This might occur when competitive organisations co-operate in order to learn from and share knowledge with each other, such as in knowledge sharing communities. On the one hand, learning (through co-operation) is an added value for all parties involved, but on the other hand knowledge sharing initiatives might be hindered if the competition is too strong. Then exploitation might appear, based on the perspective of 'knowledge is power'.

Similarly, von Hippel (1987) refers to rival organisations, in which people in informal networks that resemble a less visible (latent) community, trade their know-how among each other. His study indicates that these informal networks have their own dynamics that seem even 'stronger' than the rivalry among the organisations. Individuals in such an informal group with strong ties tend to share and create knowledge easily, even though their organisations were highly competitive. Bengtsson and Kock (2000) have seen similar effects in their case studies on 'co-opetition' in business networks. They further suggest that individuals might find it hard to simultaneously co-operate and compete with another person, although organisations as a whole can benefit from it. Therefore, individuals and groups are said to be better off choosing either for competition or for co-operation with a particular relation. Knowledge sharing and development are a specific form of co-operation. If 'invisible' communities can be considered as informal networks (with a core group of members co-operating), it seems that knowledge is more easily shared and created in less visible communities than in visible communities (*proposition one*).

Trust is seen as an important factor that influences the sharing and creation of knowledge (Parkhe, 1993; Larsson et. al., 1998). Trust can be enhanced by three factors. First, the idea of a 'shadow of the future' (Axelrod, 1984) implies that, if the participants involved have the perception of a shared future, it is more likely that they will evolve towards a co-operative strategy (in order to avoid retaliation for example). Second, experiences from the past with a certain partner or with networks or structures alike tend to 'colour' the strategy or perception of the other party, the situation, or the payoff (see also Gulati, Nohria & Zaheer, 2000). As Inkpen and Dinur (1998) state: *"Organisations can use their alliance experience as the basis for managing and creating knowledge"* (p. 466). And third, the process itself tends to 'shape' the actions and strategies as well. In Delta it seems that less visible communities have a longer history together, because it is a tight group of people who are highly expert and who have often known each other for many years. They also have a larger 'shadow of the future' compared to visible communities, because of overlapping memberships, for example. This

might imply a higher level of mutual trust to share and develop knowledge in less visible communities than in visible communities (*proposition two*).

ICT. A second challenge is to find the 'right' ICT tool, or configuration of tools, for a certain community. This is not as simple as it may appear at first sight. At least some insight in the group, its members, and the way they work together and their goal is needed. And how the tool is introduced is at least as important as the tool itself. Besides that, after a tool is introduced a group more or less appropriates to the tool. The typology introduced in this paper might provide some help in selecting the right configuration of tools. As we have seen, the typology gives a rough indication of the focus and constellation of the group, which may give an indication of how the groups might be supported using ICT. This is in accordance with Wenger (2001), who states that it is useful to start with the factors of communities of practice that can successfully be affected by technology.

Relating the above to the first dimension implies that the focus on existing knowledge may need a different kind of support than the focus on new knowledge. For the purpose of sharing existing knowledge, a shared database for instance, might be useful. However, this may not be sufficient or useful for the creation of new knowledge. It may be that in this latter type of groups, discussion boards for example, are more successful (*proposition three*). So, try to make the focus of the community explicit and find the appropriate ICT that supports this focus.

With respect to the second dimension of the model, in Delta people who gather under a specific name or label, and have a high visibility as a group, often were centrally organised. This aspect could it make easier to centralise ICT support. Further, these communities mostly had an explicit, formalised starting moment, so this moment could, with new groups, be used to explicitly think about and discuss the ICT tools to be used. Meanwhile, people who were members of a less visible community mostly had developed their ways of working already, which is very hard to change. Most members of this type of communities did not appreciate the new introduction of any tools or artefacts, they just wanted to use what they always used and they said they were effective that way. These two differences are related to the dilemma which Wenger and Snyder (2000) mention: *"Although they [communities] are self-organising and thus resistant to supervision and interference, they do require specific managerial efforts*

to develop them and integrate them into an organisation. Only then they can be fully leveraged." Maybe the differences described here can help somewhat to solve this dilemma. We suggest that certain ICT tools can support a highly visible community, while a less visible community might only be disturbed by it (*proposition four*). So, give the first type of group more centralised support and do not disturb the ways of working already developed by the second unnecessarily.

2.6 Conclusions and discussion

In this paper we tried to give a systematic overview of the communities we have found in the Delta case organisation. A preliminary typology of communities was introduced to help formulate propositions for inter-organisational and technological conditions that support communities. The typology includes four types of communities, along two dimensions. The first dimension runs from the focus on existing knowledge to the focus on new knowledge. The other dimension distinguishes highly visible communities from less visible communities.

However, some limitations of the framework have to be mentioned. The guidelines are based upon a recently started research project within this specific case organisation. Additionally, the communities described are, of course, all related to this case organisation and therefore the members all have professional experience with both sharing and knowledge development. It is possible that this provides the described communities with rather typical or specific characteristics which makes them different from communities with participants who are not professional 'knowledge workers'. Therefore, it seems interesting and relevant to additionally study communities within a less knowledge orientated network organisation.

With respect to dimension one in the proposed model, the distinction between the focus on existing knowledge and the focus on new knowledge may be somewhat artificial. Knowledge can be considered as a socially constructed concept, and this might imply that all knowledge processes are in a sense both focussed on existing and new knowledge. However, the conditions for success of the community depend on the goal of the community. Therefore, this study attempted to focus on the purpose of the described communities. Thus whether the community goals and activities primarily focused on doing research together (with a focus on new knowledge), or on exchanging knowledge and experiences (with a focus on existing knowledge). It appears that this can provide some interesting insights.

A critical remark on the second dimension is that communities in time might change from a network of high visibility to a network with low visibility; a group which is stable in name but not in memberships, might gradually change into a 'permanent' network of individuals. In that case, the participants of the group become motivated to stay in contact, even without the label, which was used to gather in the first place. This can be related to literature on lifecycles of groups and communities (Tuckman, 1965; McGrath, 1990). And again, the distinction between the two 'types' might be somewhat artificial, because often communities have a core, fixed group of members with some peripheral members around it. These peripheral members move much more in and out of the community than the core members do (Lave & Wenger, 1991). This makes it hard to classify this type of groups. We tried here to base that decision upon the most prominent features of the group. Therefore, further study must be done to see whether the dimensions can serve as a continuum. As said, the two dimensions present a 'tendency' of communities to act in a certain manner.

In sum, this paper presents a typology of knowledge sharing communities, based on case studies in the Delta organisation. Although the typology for some groups might not be immediately clear, we think it can lead to interesting guidelines for communities in practice, as we have shown. Given the limits in empirical material and the preliminary state of analysis, the typology and propositions are still tentative and have to be confirmed in further case studies.

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Appendix I. Descriptions of four communities in Delta

Example of a Visible exchange community:

Community **"Risk analists"**
Members of this community are people and organisations that are working in the field of (probabilistic) risk analysis and reliability in a broad variety of disciplines, such as civil engineering or industrial engineering. In this large visible network of around 270 people, the regular meetings are every three to four months. In these meetings several members give a presentation about a certain topic, which is related to application of probabilistic reliability or risk analysis (or decision support). According to our respondent from this community these meetings are important to stay up-to-date in this domain. Visiting the meetings enhances knowing what other people are working on. Some members visit these meetings because of this keeping up-to-date. Others, who may not even be working in the practice of application of probabilistic reliability or risk analysis, need some information about it for their own projects. One could say that these members are more in the periphery of the network, compared to the experts in this practice. All however are there to share existing knowledge.

Example of an Invisible exchange community:

Community **"Joint safety"**
In the seventies the idea of standardisation of safety analysis arose. Different parties from all over the world gathered in a joint committee on structural safety. The network nowadays consists of approximately twenty people from Germany, England, France, Denmark, Japan and America, but mainly from Europe. Most of the members work at universities and all of them are experts in the field. New members are invited by current members to join. The group has set itself the task to formulate guidelines for the analysis of structural safety.

A (less visible) core group of about ten people meet in this formal committee twice a year (often connected to a relevant conference). However, they all know each other very well, because this is just one of the 'clubs' they are in. They have a shared identity and interest in safety-related issues. In this committee context however, they meet to discuss ongoing issues. The meetings have both informal and formal parts. The chairman of the network and his secretary prepare an agenda for the meeting. Most items concern agreements on deliverables of one or more members. The progress is checked and sometimes there is a discussion on content. These discussions are, most of the time, very intensive. Members of the group are highly qualified experts and really like to discuss practice related issues in the smallest details. Therefore, these meetings are experienced as joyful by the respondent from this community, who states that it is not that often that one can have such intensive discussions with other experts, with peers, in the field. Moreover, the meetings give him the possibility to check with peers whether he still keeps pace. Sometimes a subgroup meets in preparation of a common paper. The intention is to deliver the papers as a group; therefore they are thoroughly discussed in the meetings. Subgroups of two or three members, who have to prepare papers, use e-mail to distribute their contributions to the other members of the network. But since recently the network has its own Internet site with the possibility to upload documents. It is not clear yet whether this is going to work, so, whether the Internet site really will be used.

For the respondent the meetings are an important source of information. They help him to keep up-to-date in the field. He is informed about new developments and picks up ideas, or suggestions for further research. Thus, this group of people shares existing knowledge around the practice of safety issues.

Example of a Visible innovation community:

Community **"Coast-wise"**
After the disastrous floods in 1953 in the 70s a relatively small incident happened [a collapse of a dike caused a flood with one casualty]. This had spurned the then Dutch minister (of Public Works and Transportation) to prevent any such incidents to become a disastrous flood. So he established a Technical Advisory Committee of 20 people around the practice of protection of The Netherlands against flooding from sea or main rivers. This committee meets every two months. Its members are officially appointed and directly advise the minister. Four permanent workgroups perform projects (and work) for the advisory committee. These workgroups each create knowledge that can inform the advisory committee on specific matters. Only after approval of their results it will be included in the official advice of the advisory committee to the minister. One of such workgroups is the "Coast-wise" community.

'Coast-wise' consists of 14 to 15 people that meet at least 5 times a year in the context of the advisory committee but see each other more often in other less visible contexts. Topics of research in 'Coast-wise' are carried out by engineering consulting firms, Waterboards and State authorities and research institutes or universities in The Netherlands that are involved in coastal research. They are asked to write research proposals and explore the unknown facts and figures of the coastal practice. A few members of 'Coast-wise' are appointed to guide the research project on a more regular basis. Topics mainly concentrate on safety issues in the coastal zone (and recently also environmental and management or control issues), in order to have enough knowledge to be able to prevent incidents. Examples of issues are the following: are the dunes strong enough and how much sand is eroded in storms. Although participation is voluntary and projects receive a subsidy, members should be asked (appointed) through official letters. The members are usually people 'renowned' for their excellent performance or knowledge and are highly experts in their field. Thus, 'Coast-wise' normally does not consist of 'rookies' or young researchers. So, all of the members already knew each other before entering this particular co-operation. It has many similarities with an 'old boys network'. And although you only can become a member through invitation by official letters, these official letters are sent to people already known by members of the (latent) network. This network is considered important as well for knowledge processes, such as creation of new innovative knowledge.

Example of an Invisible innovation community:

Community **"Sedimentation group"**
The work in this community takes place within the context of a large co-operative innovative project in the field of civil engineering. The focus of this recently formed group (just a half year running), is the development of a sedimentation model for the main port of Rotterdam. In this project, representatives of four out of the five partners from Delta are brought together to establish an ambitious project where a system can forecast the sedimentation of harbours. The total group has about 15 members, who did not know each other before starting this group, but currently form a sort of visible network.

Over the year, 4 plenary sessions have been planned. These are complemented with sessions of smaller subgroups. According to the respondent from this community, weekly contacts between individual actors in this network are usual. These interactions are mainly established in face-to-face meetings, or by using phone and e-mail.

Although all participants are representatives from different, more or less competing, organisations co-operation seems to work out well after an initial phase of 'getting-to-know' each other. It seems that all participants in this project are aware now of the fact that the work done so far could not be achieved by one of the partners alone, because it is a new topic and scope. Each party involved is a necessary participant. The volume of collected data is quite massive and will be shared freely among the participants.

While studying this work group, it becomes clear that also for participants c.q. respondents the borders between networks and project teams are fuzzy. Although the participants know that it is officially a project group they are working in, the perception that the group has network characteristics is obvious.

The intention of this group is to use the ICT groupware tool, provided by Delta, for the project work. The respondent was young and enthusiastic about the tool and clearly saw the advantages of using this instrument. The idea was to upload the information coming from the subgroups into the system, in order to inform the full group about the activities and results. The respondent even encouraged colleague project workers to use the tool by providing them shorthand documents of how to use the tool.