Delft Cluster

Title:	**Collaborative working in Delft Cluster: Setting Up Communities of Practice**

Author:	Dr. Ir.N. Kukuric	Institute:	TNO-NITG
Author:	Ir. S. Velickov	Institute:	IHE Delft
Author:	Dr.Ir. J. van der Spek	Institute	Telematica Institute

April 2003

Number of pages	:	72	
Keywords (3-5)	:	Collaborative Working, Knowledge Management, Communities of Practice	
DC-Publication-number	:	DC1-731-1	
Institute Publication-number (optional)	:		TNO-NITG
Report Type	:	☐	Intermediary report or study
	:	☒	Final projectreport
DUP-publication Type	:	☒	DUP Standard
		☐	DUP-Science

Acknowledgement
This research has been sponsored by the Dutch Government through the ICES-2 programme. The Netherlands Water Partnership (NWP) and the National Institute for Coastal and Marine Management (RIKZ) also financially contributed to this project.

Other Research project sponsor(s):

TNO | IHE DELFT | Telematica Institute

Abstract

The main objective of the project was to set up a collaborative environment for Delft Cluster (DC) researchers and their external partners. In the course of the project realisation, a package of Knowledge Management Services has been developed to support collaborative working in DC Communities of Practice and Project Teams. The package contains both People Network Services and Technology Framework Services, to be provided on-site and on-line. In the framework of the project the multimedia collaborative tools have been extensively surveyed and tested.

The project dealt with a long-term collaboration among research organisations. Design, development and implementation of Knowledge Management Instruments in a cross-organisational research set-up has proven to be a major challenge. The main obstacles to collaboration, the Lessons Learned and some concrete project achievements regarding promotion and facilitation of collaborative working are described in detail in the project report.

PROJECT NAME:	**Collaborative working in Delft Cluster: Setting up Communities of Practice**	PROJECT CODE:	**07.03.01**
BASEPROJECT NAME:	**Communities of Practice**	BASEPROJECT CODE:	**07.03**
THEME NAME:	**Knowledge Management**	THEME CODE:	**07**

Executive Summary

The project "Communities of Practice" was one of the projects of the Delft Cluster Research Theme "Knowledge Management". The main objective of the project was to set up a collaborative environment for the Delft Cluster Knowledge Centre. This objective has been achieved, and the most important findings regarding the facilitation of collaboration in the Delft Cluster Knowledge Centre are listed below.

Knowledge Management *Research* Theme was set up to *facilitate* collaboration in Delft Cluster. Unlike disciplines contained in the other six Research Themes, knowledge management was not the core competence of any of the participating organisations. Consequently, no necessary expertise on Knowledge Management was available at the beginning of the Research Programme. However, as KM models and instruments cannot be applied according to a blueprint, some research on specific needs and requirements of Delft Cluster was required anyhow. Gaining the expertise on knowledge management and studying the specifics of Delft Cluster took some time, so that crucial momentum in applying KM instruments and services at the very beginning of the Research Programme was lost. This holds especially for the Project Teams who had to be informed about the role of knowledge management on time (during the kick-off meetings) and to be supported by a set of KM services from that moment onwards.

Quite some DC researchers seemed to appreciate Delft Cluster as another government co-funded project. The ambition of Delft Cluster to establish a long-term collaboration was sufficiently communicated to them, but the role the researchers were supposed to play to achieve this ambition was certainly not. DC researchers are supposed to share their knowledge in order to create and subsequently disseminate new knowledge. This process is however, very delicate, especially in situations where one DC partner may want to claim expertise over a certain technology or problem area. The question remains whether at the start of such an ambitious endeavor a rather loose cross-organisational setup can ensure a sufficient commitment to a substantial knowledge sharing among organisations that for some of the time are also in competition.

The character of the Delft Cluster organisation also played an important role in the realisation of a DC technological (knowledge) platform. DC partners use various, not necessarily compatible, software and hardware. Consequently, the selection of a DC technology also had to serve important corporate company interests. Yet, some progress towards implementation of a common (or at least compatible) technology has been made.

The first Delft Cluster technological platform (DC Intranet) was launched after a few months of the beginning of the Programme, but without a proper announcement. In particular, *roles and responsibilities* of DC Back Office, KM Theme and project leaders regarding the content of the Intranet were not clearly defined. Consequently, for a long time the content was infrequently updated and the site was hardly being used.

In the course of the Research Programme realisation, a package of KM services has been developed to support collaborative working in DC Communities of Practice and related Project Teams. The package contains both People Network Services and Technology Framework Services, to be provided on-site and on-line. Some of the services have already been implemented, such as a (digital) Collaborative Working Environment, where more than a hundred Project Teams have their collaborative workspaces. Unlike the DC Intranet, the Collaborative Working Environment was announced properly, introductory workshops were held and on-line support has been provided. Yet, a wider use of Environment could have been achieved were it not for a number of reasons (see below).

Most of the DC researches had *no experience* in working in a digital environment, so they had to be *motivated* to learn to use it. As DC researchers were not *obliged* to use the Environment, therefore they had to be motivated by clear specification of a possible contribution (added value) of the Environment to the project execution. However, many DC projects were split into tasks to be accomplished (as much as possible) by individual team members, minimising the need for intensive collaboration. Besides, some DC

teams were small (3-4 members), and some had a majority of team members coming from the same DC partner organisation. In those teams the need for collaboration in a digital environment was not particularly strong, so that team members decided to collaborate as they usually do in external projects (e-mail, phone and occasional face-to-face meetings).

In separate series of workshops, a comprehensive KnowMe questionnaire was developed in order to measure the state (and the progress) of knowledge management in Delft Cluster. The measurement has been shown to be helpful in specifying the needs of Delft Cluster researchers. For instance, the DC Intranet and Collaborative Environment would have been more frequently used if they provided information on *side issues* (project management and evaluation, publishing procedure, intellectual property rights, etc). Obviously some KM services should be integrated into a corporate function, provided by a Back Office. The issue of a Back Office points to the *organisational aspect* of knowledge management; this third - next to technological and social - knowledge management aspect has not received enough attention in the Delft Cluster virtual organisation.

Within a company, *organisational structure* is used to foster the realisation of knowledge management activities. Line management in the company has more authority than the management of a cross-organisation *virtual* knowledge centre. Additionally, knowledge management at the company level is carried out with backing of various organisational units (i.e. Personal Dept, Financial Dept, Project Office, Communication & Documentation Dept.). The Delft Cluster Back Office was originally very understaffed, consisting of scientific director, financial deputy, secretary and PR officer. As such, the Back Office could not meet all the needs of DC researchers.

Not only needs and requirements of researchers are in question, but also those of the Delft Cluster Knowledge Centre. Therefore a mechanism should be introduced (institutionalised) to *secure participation* of researchers in knowledge management activities. Although knowledge sharing can be only voluntary (and not conscripted), agreements can be made (including penalties and bonuses) on processes that support or enable knowledge sharing. If a substantial part of knowledge is generated in Project Teams, some knowledge management activities need to be incorporated into a project management procedure. For instance, filling in and updating a Project Knowledge Card or extracting Lessons Learned (both required for the DC knowledge repository) should become a compulsory part of project management procedure.

Cooperation with the GWW sector established during this project could be considered as satisfactory. This holds especially for the NetCoast and NWP project partners because the products and services provided by the CoPs Team are still in use by these organisations. This is a tribute not only to the CoPs Team but also to their partners, who are committed to active usage of the developed tools and related services. In the case of the Netherlands Hydrological Platform (NHP) the motivation to use a newly-developed platform was minimal. This confirms once more the importance of the organisational aspect of Knowledge Management.

In the Netherlands, large (Delft Cluster like) cross-organisational projects are initiated and co-financed by government on regular basis. These projects yield, in general, satisfactory results, but often do not leave behind enough leverage for continuation of an intensive collaboration after the project completion. The question is how could knowledge management most efficiently support on-going and future collaboration? An inquiry conducted by DC KM Theme showed involvement of DC researchers in over a hundred various CoPs, some of them originating from previous cross-organisational projects. Any attempts to formalise these *old boy networks* failed. Therefore, what Knowledge Management can do in a cross-organisational research setup is to promote knowledge sharing during the project execution, to develop a common digital knowledge repository and collaborative environment, and to provide an efficient dissemination network. In the last three years the DC CoPs Team tried hard to contribute to these goals.

PROJECT NAAM:	**Collaborative working in Delft Cluster: Setting Up Communities of Practice**	PROJECT CODE:	**07.03.01**
BASISPROJECT NAAM:	**Communities of Practice**	BASISPROJECT CODE:	**07.03**
THEMA NAAM:	**Knowledge Management**	THEMA CODE:	**07**

Table of contents

List of Figures

List of Tables

1 Introduction

The project 07.03. “Communities of Practice” (CoPs) is one of the Basis Projects of the Delft Cluster (DC) Research Theme 7 “Knowledge Management” (KM). The content of this Basis Projects (under the original name “Collaborative Working”) is given in the Theme 7 Research Programme (accepted version 2.1, December 1999). In the period December 1999 - April 2000 several versions of proposals for individual projects within the CoPs Basis Project were prepared and submitted to the Theme 7 and DC management. Eventually two individual projects were defined and accepted, namely:

- 07.03.01 “Collaborative working in Delft Cluster: Setting up Communities of Practice” and
- 07.03.02 “Knowledge Sharing in Delft Cluster Communities of Practice”.

This report describes activities carried out in the framework of the individual project 07.03.01. The project effectively started in April 2000, although the project proposal was not formally accepted by the Directie until February 2001. A rather long acceptance span was quite common for DC projects, especially for those of Theme 7.

The main objective of the project was (according to the project proposal) to “set up a basic environment for a Delft Cluster Knowledge Centre”. The objective was to be achieved through accomplishment of the following three tasks:

- identification of specific needs and requirements related to collaborative working in Delft Cluster,
- development of a concept for DC Communities of Practice and
- prototyping of DC Communities of Practice.

Due to the delay in the proposal acceptance, the original proposal prepared for “the first project phase” (with duration of 18 months) was later extended in order to prolong project activities until the end of the 2002. The main additional task added to the project was:

- testing of additional KM instruments that could facilitate collaborative working in DC.

Specifics of collaborative working in Delft Cluster (the first project task) were investigated in the period April 2000 - November 2000 and reported in the first interim report; the brief overview of related activities and results is given in the second chapter of this report. The main outcome of conducted research was expressed in a decision to implement a DC Collaborative Environment. The implementation of the Environment is described in the second interim report and in Chapter 3 of this report. Subsequent analysis of DC Collaborative Environment provided an additional insight into Ways of Working (WoWs) in DC Project Teams and the requirements for a successful management of knowledge in Delft Cluster. As such, it served as a basis for development of DC CoPs Concept and Services presented in the Chapter 4. The CoPs Services were elaborated in a form of guidelines for supporting collaborative working in DC CoPs. In the Guidelines, the special attention is paid to People Framework Services, to-date insufficiently implemented in Delft Cluster. On the other hand, Technology Framework Services were successfully implemented in the several CoPs that were set up in co-operation with the project external partners or “the Sector” (Chapter 5). Chapter 6 covers the testing of some additional KM instruments (collaborative multimedia tools), which was the last project task. The main conclusions and recommendations are listed in the closing chapter of this report.

2 Collaborative Working in DC: Needs and Requirements

This chapter could have also been named as “Struggling for the soul of Delft Cluster”. While attempting to elaborate a domain of “collaborative working” in Delft Cluster the CoPs project team was confronted with a whole range of organisational, social and political issues which had to be solved or at least examined and discussed. Therefore this chapter is also a review of the DC Knowledge Management maturing process. After a lot of struggling the process resulted in the specification of one single need (requirement), namely the implementation of a DC Collaborative Environment (Chapter 3). At the time of the proposal preparation, a specification of needs and requirements related to collaborative working seemed to be a logical first step in the implementation of Knowledge Management Instruments (Services) in order to support collaboration in Delft Cluster. The term “needs” in this case refers to needs of researchers involved in Delft Cluster projects, whereas the term “requirements” points to requirements to be fulfilled in order to achieve Delft Cluster goals. As one could expect, needs and requirements did not match completely, as elaborated below.

2.1 The Needs - Learning by Doing

In 1999, no information could be gathered on the “present” needs of DC researchers simply because at that time Delft Cluster did not exist. Presuming that something on anticipated needs could be learned from leaders of other six DC Themes (other than Theme 7), a number of meetings were organised to discuss a future implementation of Knowledge Management in Delft Cluster. The meetings resulted in several proposals, most of them related to ICT component of Knowledge Management (e.g. development of databanks and homepages) or to modelling (in DC Theme 7 models have been seen as encapsulated knowledge systems, and (consequently) their interfacing as a Knowledge Management activity). Noticeably, only a few proposals included social/cultural aspect of collaboration, regardless of the fact that the first Theme 7 project proposal was rejected because t was regarded as being too technical (too ICT-oriented). In addition, the importance of social/cultural dimension was emphasised in every meeting by using a simplified Knowledge Managing Enterprise diagram of the Garther Group (Figure 1).

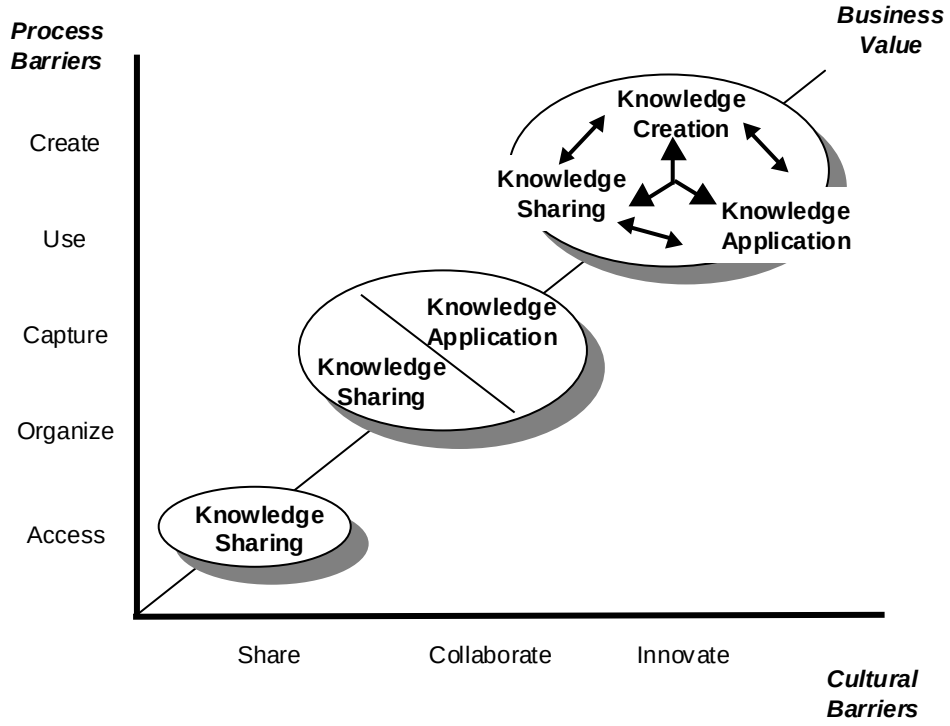


Figure 1: Knowledge Managing Enterprise (source Gartner Group)

Nevertheless, some proposals made by other Themes were seen as possible CoPs activities. Accordingly, the CoPs Team was requested to work out these proposals together with corresponding individual project teams from the other Research Themes. Actually this meant assessing the needs of DC researchers *by doing*, which was an acceptable option if the Knowledge Management in Delft Cluster was regarded as a research subject (this issue will be discussed further in this chapter). The collaboration with DC Research Themes 1-6 is briefly described below.

Theme 1

The CoPs Team was actively involved in the project "Digital Knowledge Platform for Soil and Construction". In the feasibility study (project 01.07.01) the team contributed with an analysis of digital technological platforms (see the report 01.07.01, June 2000). One of the platforms (DocuShare) was made available to Theme 1 project members for testing purposes. During the realisation of the Digital Knowledge Platform (project 01.07.03) the CoPs Team members contributed in almost each segment of project execution (planning and conducting the interviews, workshops, monitoring, etc.). The results of this project are presented in a separate report (reporter J.J. Olie, the project leader). As far as collaboration in this project is concerned, a few points should be mentioned here:

- The enthusiasm of the project leader was a driving force behind this project. Without it this project would never be accomplished.

- The lack of enthusiasm and commitment of Theme 1 researchers ("the user group") involved in this project was more than evident. Nevertheless, it helped the CoPs Team to assess the (obviously limited) needs of DC researchers for Knowledge Management Services.

- The workshop organised by Theme 7 members (hence not only theCoPs Team) was a rare opportunity to see the (high) potential of Theme 7 in terms of the accumulated knowledge and services it can offer.

- The selection of the pilot project (i.e. the user group) and the digital platform was influenced by the DC partner who had a dominant role in Theme 1. The selection did not correspond to the purpose of the project (that is piloting of the collaborative working) at all.

Theme 2

Possibilities to facilitate collaborative working in Theme 2 were discussed with the Theme's co-leader, E. Cale, on two occasions during the year 2000. An initiative was made towards facilitation of the Theme's Klankbordgroep, being an existing CoPs (composed of members of Technisch Advies Commisie Waterkeringen). Unfortunately, the Klankbordgroep did not appreciate the formalisation of the "old boy" network, so this initiative failed. Fortunately, some Theme 2 researchers have since adopted the DC Collaborative Environment (see Chapter 3) as their digital project workplace and used it quite extensively. The reaction of Theme 2 on the Knowledge Management initiative yielded some preliminary conclusions:

- Whenever possible the concept of Knowledge Management and KM Services should be introduced in face-to-face contacts.

- In some situations a motivational mechanism (bonuses & penalties) can be introduced to support the acceptance of Knowledge Management Services. In situations where such a mechanism is not or cannot be implemented, a decision on the use of KM Services (or simply to co-operate) depends of a number of interwoven factors. It would be too easy to say that some researchers in Theme 2 have seen the merits of co-operation and some have not (see Chapter 3.6).

Theme 3

Initial contacts with Theme 3 (H.J. van Verhagen) were made in February 2000. No specific need for a contribution of the CoPs project could be identified at that time. In the Theme 3 proposal a priority was given to document and content management, and this was the subject of another Theme 7 Basis Project. When contacts were made again (early 2001), it appeared that Theme 3 had developed its own project site in order to strength the co-operation and promote their work (as a project community). The site was nicely designed and the content was regularly updated by one of the project members. However, it did not have potential of a digital collaborative platform, like (at that time) the newly-developed DC Collaborative Environment had. It was therefore a logical step to link these two environments. Once that was accomplished the Theme 3 researchers who developed the project site started with the same enthusiasm to use DC Collaborative Environment. A suggestion was also made at that time to fully integrate the collaborative environment into the project site (as the CoPs Team did later for Netherlands Hydrological Platform - see Chapter 5). However, the CoPs Team could not obtain the necessary access to the server where the Theme 3 project site resided.

Two additional remarks can be placed here regarding the collaboration with Theme 3:

- In numerous contacts with DC researchers during the year 2000 the CoPs Team tried to specify their needs in terms of Knowledge Management Services. Many researchers expressed their needs by specifying the shortcomings of the DC Intranet (see further in this Chapter). Theme 3 was the only one (to our knowledge) who took the initiative to fulfil its own KM needs.

- The CoPs Team developed some specific KM applications for NetCoast (Chapter 5). Although some interest was shown in these applications by Theme 3, no concrete collaboration links between Theme 3 ("River and Coast") and NetCoast were established.

Theme 4

During the year 2000 and the first months of 2001, the CoPs Team was involved in the project "Knowledge Management for Urban Renewal". The CoPs Team leader attended a series of meetings where the content of this project was discussed, and he contributed to the project proposal (Appendix II: "Samenwerking: vorm en uitwerking"). He also took a part in the two-day long kick-off meeting and in the LiveLink user's group (LiveLink was chosen as a collaborative environment in this project).

This project was largely financed from the ICES budget that was originally allocated to Theme 7 Basis Project Communities of Practice. After the budget reallocation, an additional budget was made available in Theme 7 for the involvement of the CoPs Team in this Theme 4 project. The budget was however, not controlled by the CoPs Team and no assignment was received (in spite of promises) from Theme 4. Eventually, after the budget cutting exercise in February 2001, the CoPs Team was forced to cease its activities in this project.

Theme 5

A rather ambitious plan on co-operation between Theme 5 and Theme 7 was originally set up by the leaders of corresponding Themes. It envisaged contribution of the CoPs Team in eight Theme 5 projects. Three of these projects were initiated but never realised, among them the ABIS (05.02.01) where CoPs Team made some initial contribution. For the projects

- Predicting the Structure of the Subsurface (05.02.01)
- Sedimentation Model for a port of Rotterdam (05.02.07) and
- Upscaling Micro-heterogeneities (05.03.01)

meetings were held with the project leaders in order to elaborate the needs for Knowledge Management Services. It appeared that all the project teams needed a common digital workspace. The DC Collaborative Environment was at that time (the first half of 2001) already operational so the workshops on the use of the Environment were subsequently organised and held for each of the project teams (see Chapter 3).

The project Internationalisation (05.04.01) started rather late (the end of 2001) and will last until the end of 2003. A project management plan (prepared in the framework of this project) encompasses support for the establishment of an International Consortium on Sustainable Subsurface Management (SSM) and to organise a conference on SSM in the Netherlands in 2003. At the time of writing of this report the 05.04.01 is still an on-going project. The contribution of CoPs Team in this project will be reported separately in year 2003 (reporter N. Kukuric).

Considerable time and effort were invested in the Theme 5 project "Knowledge Management" (05.04.02). Several versions of the project proposal were prepared, including a proposal for SKB (Stiching Kennis Bodem) called "Decision Link". A brainstorm session was organised, gathering representatives from SKB, DC Management, DC members and their external partners (the Sector). Attempts to get this project started finally ended when the project leader of 05.04.02 and the co-leader of Theme 5 in charge of co-operation with Theme 7 left GeoDelft and Delft Cluster.

The experience gained in Theme 5 showed the high level of uncertainty with which the initial proposals on possible co-operation were made. In particular, communication with the leaders of the selected individual projects was poor.

Theme 6

Initially, (the end of 2000) none of Theme 6 projects was indicated by Theme leaders as a place for possible implementation of CoPs Knowledge Management Services. (Much later - in the spring of 2001 - a few of the Theme 6 project teams started to use the DC Collaborative Environment.) Yet, the CoPs Team strove to establish co-operation with all six of the other DC Research Themes, or at least to develop something useful for them, even outside the framework of defined DC research projects. One of the initiatives was to support WaterNet, a network of universities and research institutes in southern part of Africa ("from Nairobi to Cape Town, from Windhoek to Maputo"). One of the major activities of WaterNet is to set up a regional masters programme in Integrated Water Resources Management. The WaterNet initiative was very appropriate, considering the ambition of Delft Cluster (to become a world leading centre) and the general lack of an international dimension in the current DC projects. In spite of mutual (WaterNet and CoPs Team) enthusiasm, WaterNet did not succeed to provide the co-financing necessary for this project.

The other initiative was to support the establishment of the Netherlands Hydrological Platform (NHP). This developed into one of the most successful CoPs Team activities. Experience with the NHP was very useful for the process of defining the CoPs Concept and Services. Development of the Platform was at the same time prototyping a CoPs and the collaboration with the Sector. As such it is described in detail in Chapter 5.

The collaboration of the CoPs Team with DC Themes 1-6 yielded some general conclusions on the needs of DC researchers regarding collaborative working:

- A general impression was that DC researchers did not know what Knowledge Management was and what they might expect (gain) from it.

- A majority of DC researches experienced Delft Cluster as "just another" government co-funded project. The ambition of Delft Cluster to establish a long-term collaboration was probably sufficiently communicated to DC researchers, but the ways of achieving this ambition certainly were not.

- None of contacted DC researchers expressed the need to improve the social/cultural or organisational aspects of collaborative working in Delft Cluster.

- Some DC researches expressed the need for a digital collaborative environment. A majority of DC researches had no experience in working in a digital environment.

- The subject of research and the size and composition of a project team determine substantially the intensity of communication and co-operation in a project. Whenever possible, DC projects were split into a number of tasks to be accomplished by individual team members. If the project team was relatively small (3-4 members) the communication among the members (including face-to-face meeting) was relatively easy to organise. This was true especially for the cases where the majority of team members came from the same DC partners.

2.2 The Requirements - Terra Incognita

The first ambition of DC Research Theme 7 is clearly stated in the Theme's Research Programme: "to facilitate research within all Delft Cluster Research Themes". This statement (on page 2) is followed by circa 90 pages of elaboration, that is, on how is that "research" ambition is going to be achieved. However, it is not mentioned *when* it should happen. In 1999 there was hardly any knowledge on Knowledge Management in Delft Cluster. The topics of the other DC Themes (in general: soil, water, constructions) were the core-businesses of particular DC Partners. Theme 7 had to start from the scratch. The task that Theme 7 (including the CoPs Team) was facing could be elaborated in three major activities:

1. to gather knowledge on Knowledge Management,
2. to conduct research on Knowledge Management in Delft Cluster and
3. to implement the results of the research.

Obviously only the third activity matches the ambition of Theme 7 stated above. The problem was that some KM Services needed to be provided at the very beginning of DC projects. The problem could have been partly avoided by engaging a consultant in the field of ICT and organisational (project and change) management (Cap Gemini, KPMG, CIBIT or similar). This could be done partly, because even the consultant would need some insight in specifics of Delft Cluster (the second activity) before implementing any KM Services.

Some members of DC management and Themes 1-6 management teams expected Theme 7 to provide services to other Themes immediately after the project was started. Due to the unclear status of Research Theme 7 (research or services?, or both but in a sequence?) these expectations could not be met, causing an undesirable tension between the Themes and within Theme 7 in particular.

Most of the requests made by the other Themes were for technological (ICT) and Project Management support. Technological support meant most often software development, which Theme 7 could not provide, being understaffed. Theme 7 members (with exception of the Basis Project "Encapsulated Knowledge Systems") were supposed to facilitate DC projects regardless whether these projects were directly beneficial for their companies, that is, the DC partners. This substantially limited the interest and participation of the DC researchers in Theme 7 projects. (Much later - in May 2001 - the Theme 7 Steering Committee decided that at least some of Theme 7 activities that are "of common interest" for Delft Cluster should be financed by all the founding partners.)

Not only Theme 7, but the DC Back Office was also understaffed. The Back Office was supposed to provide the Project Management support. The fact that no clear division line can be drawn between Project Management and Knowledge Management is in principle not a problem by itself. However, the staff shortage and the unclear role of Theme 7 made this a responsibility issue. For example, for the long time scale it was not clear who was responsible for updating of DC Intranet and Internet. The issues of Project Management and the DC Intranet are very much related to the second and the third main CoPs Team activity (as defined above). These activities will be discussed further in the text, immediately after a short "literature review".

2.2.1 Gathering knowledge on Knowledge Management

The first contacts with Knowledge Management were made at the time of writing of project proposals (1999). Four years ago, Knowledge Management was an emerging discipline viewed by many as a "container term" for various developments in the fields of software engineering, communication technology, project and change management. Four years later, the term "container" is still valid, but the content of the container has increased dramatically: Google search engine currently gives, for example, more than 700.000 hits on "Knowledge Management" search term.

The CoPs Team approached Knowledge Management as a research topic, assuming the research character of Theme 7 and having in mind a "long-term strategic" research orientation of Delft Cluster. In practice, this meant an attempt to gather, systematise and analyse information on

- theoretical background of Knowledge Management,
- various KM models and tools and
- practical applications of KM (case-studies).

As one could expect, the CoPs Team started with the "compulsory literature", covering the titles such as *The Knowledge-Creating Company* (Nonaka and Takeuchi, 1995), *Working Knowledge* (Davenport and Prusak, 1998) and *The Rise of Network Society* (Castells, 1996). Of course, special attention was paid to the phenomenon of Communities of Practice; for instance, a critical review of the book *Communities of Practice: Learning, Meaning and Identity* (Wenger, 1998) was made (circa 10 pages) to be used as a theoretical background for future Delft Cluster CoPs. It took the CoPs Team some time to realise that there is no common approach to the theory of either Knowledge Management or Communities of Practice.

A similar situation arose with the practical aspects of Knowledge Management; each larger consultancy or research institution developed "its own" KM model and/or approach. Some examples (only from the Netherlands) are: *Knowledge Management* (van der Spek and Spijkervet - CIBIT, 1996), *Knowledge Infrastructure* (van Heijst and Kruizinga - CIBIT, 1997), *Knowledge Management; The Cap Gemini Way* (Cap Gemini, 1999), *Managing the Knowledge Factor* (Boekhoff et all - Twynstra, 1998) and *Acquainting Knowledge Management* (Verwijs et al - Telematica, 1999). During the Second European Conference on Knowledge Management (Bled, Slovenia 2001) at least a dozen new Knowledge Management conceptual models were presented.

On the technological side of KM, the market has been flooded by software tools being placed in the KM context and advertised as Knowledge Management Instruments. Maybe the most comprehensive overview of various software that can be used for Knowledge Management can be found in *The Knowledge Management Toolkit* (Tiwana, 2000).

Finally, there were the KM case studies. Thse are usually published by large international corporations (Unilever, Siemens, IBM, Microsoft, etc.) with the primary goal to promote their products and services. Although some of them have an exaggerated marketing purpose, for example *How to deliver $200 million through mega-communities of practice* (Boyd 2001, Shell), the others still bring useful tips and hints on Knowledge Management implementation, such as BP Amoco's *Knowledge repository; Connecting the New Organization* (Collison, 1999). Several case studies on Communities of Practice were reviewed in the report "Dynamics of Knowledge Sharing Communities" (the CoPs project 07.03.02).

The process of gathering and analysing information on theoretical and practical approaches to Knowledge Management, as well as on technology and cases from practice, brought knowledge on Knowledge Management into Delft Cluster. This section of the report started with a general conclusion on state-of-the-art of Knowledge Management. Some additional conclusions are listed below:

- No "blue print" was expected to be found in KM theory and practice that could be used in Delft Cluster. Yet, at least one KM model or one case-study was expected to show a major resemblance with Delft Cluster. Apparently, each organisation (in the DC case "a cross-organisational partnership") is a case apart. No case studies referring specifically to cross-organisational knowledge sharing could have been found. It seems as though DC is doing pioneering work in this field (Kukuric and Price, 2000; Kukuric and Velickov, 2002)

- Knowledge Management conceptual models developed by consultants are meant to support collaborative working *in* organisations but not *among* organisations (the case of Delft Cluster). Besides, there is no evidence of a successful implementation of these models in practice. Along these lines, the general KM model developed for Delft Cluster (see the Research Programme) could withstand criticism in spite of the fact it had not been implemented. Were the expectations about its implementation realistic? No, due to a number of factors, one of them (the status of Theme 7) being discussed above. Another important factor is the organisational aspect of Knowledge Management whose importance has been severely undermined. Namely, Knowledge Management relys on a strong organisational structure which was not available in the Delft Cluster "virtual organisation".

- Project Teams and Communities of Practice are indicated in the KM literature as two major forms of collaborative working. McDermott (1999a) gave a comparison between Teams and CoPs, pointing out their differences. Yet, they also have a lot in common, especially if the collaboration takes place in a virtual environment. It can be said that Teams portray short-term, rather formal collaboration, whereas CoPs are about long-term and less-formal knowledge sharing. Moreover, CoPs can be seen as continuation of collaboration in Teams; they are often formed by people who worked together in a Project Team and wanted to continue collaboration after the project accomplishment. There are many other views on CoPs, but this one matches the present and envisioned collaboration in Delft Cluster. Accordingly, it has been worked out in DC CoPs Concept (Chapter 4).

- The view on CoPs defines a concept, structure and WoWs of a Community. Yet, very few elaborated concepts of Communities have been found in the literature. In a series of articles (1999b, 2000a, 2000b) McDermott provided some general guidelines for the development and nurture of Communities. Many authors explored possibilities for and obstacles to collaboration in a virtual environment (Rheingold, 1993, Lipnack, 1997, Kooistra, 1999). Nevertheless, the approach developed by CIBIT in the framework of KALIF programme (Kelleher et al, 2001) was found to be most suitable for Delft Cluster. It addresses collaborative working in both real and virtual environments. KALIF was developed to support knowledge management in research project teams and among the teams. Support is provided through three sets of Services, related to community members, technology and dissemination of results. The KALIF methodology is discussed in detail in Chapters 3 and 4.

- Knowledge gathered on Knowledge Management did not provide a clear and complete picture on the state-of-the-art of Knowledge Management. Apparently Knowledge Management still means different things to different people. That was also one of conclusions of the WAITRO conference on Knowledge Management in Research Organisations, organised by TNO-NITG in The Hague two years ago.

- There is - to our knowledge - one major point that the vast majority of knowledge managers agree about: Knowledge Management recognises three major aspects: technological, cultural/social and organisational aspect. As far as the main KM implementation steps are concerned, no prevailing concept has been recognised. For the purpose of illustration one of the commonly used KM frameworks is given in Figure 2.

- Recently some encouraging steps were made towards development of a systematic approach to Knowledge Management (Lai and Chu, 2000, Coviello et al, 2002). Nevertheless, it seems that knowledge on Knowledge Management is mainly composed of "hints and tips" and the ability to recall and implement these at the right moment and at the right place.

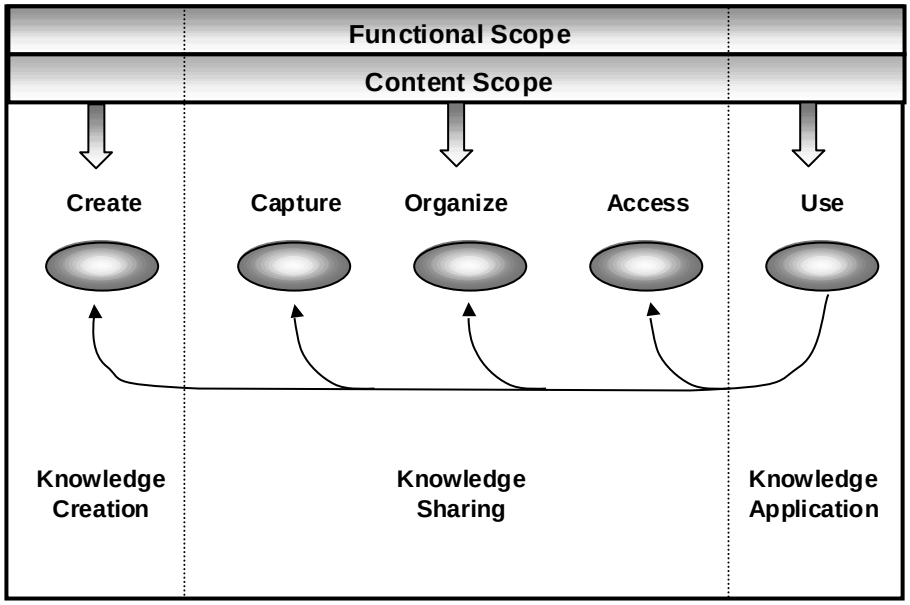


Figure 2: Knowledge Management Process Framework (source Gartner Group)

2.2.2 Research on Knowledge Management in Delft Cluster

This "internal" research on KM was needed in order to find a way to develop and implement a concept of Communities of Practice in Delft Cluster. Through its co-operation with other Research Themes the CoPs Team learned about the needs of DC researchers. In most cases these needs were bounded by individual (project) interest, except in the case of DC Intranet. Several project teams were not satisfied by Intranet, leading to requests for an interactive digital collaborative environment. On the other hand, the DC management was not pleased with a very limited use of Intranet. Obviously, some basic requirements for achieving the Knowledge Management ambition were not fulfilled. The implementation of the DC Intranet and a Project Management Environment were not activities specified in the CoPs project proposal. Yet, a certain impasse was created affecting collaboration throughout Delft Cluster. Therefore, instead of elaborating a theoretical model of DC CoPs, the CoPs Team decided to concentrate on actual impediments to collaborative working in Delft Cluster. After conducting some additional research, two brief documents were produced:

- A review of Delft Cluster Intranet (preliminary considerations) and
- Project Management in Delft Cluster Digital Environment.

(Both documents can be downloaded from the CoPs Project Site on the DC Intranet.)

The former document contained conclusions on the main obstacles to the use of the DC Intranet. Firstly, the DC Intranet was never intended to be used as a "Collaborative Working Environment". Secondly, technical limitations and especially operational problems were recognised as obstacles, but not as the main ones. For a long time the DC Intranet was just a structure without any content, an empty Knowledge Hub. He understaffed DC Back Office was too busy to fill in the Intranet regularly with corporate (top-down) information. On the other hand, DC researchers and especially DC project leaders were not filling in the Intranet with bottom-up information, because they either did not feel

obliged to do that or were not aware of the existence of the DC Intranet (the Intranet was never properly introduced).

Gradually, the DC Back Office succeeded to organise a regular update of the corporate information content. Also, gradually, communication with project leaders improved and their contributions to the DC Intranet increased. The effect of these actions was recognised by the increased number of hits that the DC Intranet was receiving. Nevertheless, the problem of collaboration remained and could have been solved only by introducing a new digital environment. Resistance of the DC Management to this idea was high ("we do not need another Intranet") and the CoPs Team invested a lot of effort to explain the role of the collaborative environment and its link with the DC Intranet (Figure 3) . the DC Intranet should serve as a corporate information centre, providing information on common documents (e.g. templates, management decisions, DC partners, staff, researchers and Themes) down to the project level. A collaborative environment would then contain everything related to a project execution: archive (with drafts, concepts, various versions, progress reports), discussions (on particular project items) and meetings (with agenda and notes). Results of project executions should also be "published" on the DC Intranet site (Figure 3).

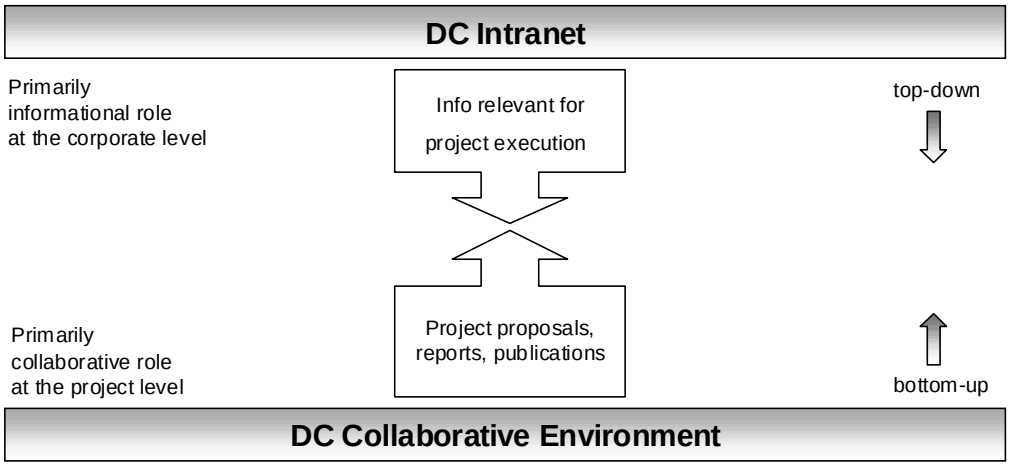


Figure 3: Relation between DC Intranet and DC Collaborative Environment

The importance of project management in Delft Cluster was addressed in the latter document mentioned above. Firstly, the relation between a co-operation in Project Teams and the future co-operation in CoPs was explained, justifying involvement of the CoPs Team in DC project management. The same document also discussed the importance of a virtual (digital) environment for the collaboration over the distance. Finally, implementation of DC Collaborative Environment was suggested and elaborated (the main steps and time the span were given). BSCW (Basic Support for Co-operative Working) was the CoPs Team choice of a technological platform to be used for DC Collaborative Environment. This choice was based on analysis of seven different platforms mutually compared using a set of eleven criteria (the analysis is attached to the document discussed above).

2.2.3 Implementing results of the research

The research on state-of-the-art of Knowledge Management (in Netherlands and world-wide) and on needs and requirements regarding collaborative working in Delft Cluster resulted effectively in one decision: the implementation of the DC Collaborative Environment. At first glance the result looks too simple to justify several months of research. Yet, it was not simple at all; the CoPs Team was confronted with basically two major obstacles:

- Knowledge Management was an emerging discipline, without a clearly defined taxonomy and little evidence of the feasibility of suggested approaches and methodologies.

- Delft Cluster was an organisation in the process of forming. Opinions about a way (scope, depth, etc.) in which collaboration in Delft Cluster should be established were quite diverse, sometimes almost diametrically opposed. Besides, organisational aspect of Knowledge Management was underestimated and the role of Theme 7 was unclear.

Nevertheless, in December 2000 the Theme 7 Steering Committee approved the implementation of the DC Collaborative Environment. The CoPs Team had already started to test BSCW platform in November 2000, and a prototype of the DC Collaborative Environment was made available to Theme 7 researches within a few weeks. In the period between November 2000 and February 2001, the prototype of the Environment was intensively tested by Theme 7 researchers. The results of the testing were used in the development of the operational version of the Environment that was launched in February 2001 (Chapter 3).

3 Implementation of DC Collaborative Environment

In February 2001 the Basic Support for Co-operative Working (BSCW) was installed on the server at IHE and made accessible via http://dc.ihe.nl. BSCW is an off-the-shelf technological platform chosen for the Delft Cluster Collaborative Environment (see Chapter 2). The homepage of the DC Collaborative Environment (Figure 4) introduces the Environment, its purpose, functionality and the access options. The Environment has a public space, which can be accessed freely and anonymously. The project workspaces can be accessed only by DC researchers and their external partners. They log in via the Home Page using a unique username and the password. Prior to that, the users of the Environment need to be registered by the administrator.

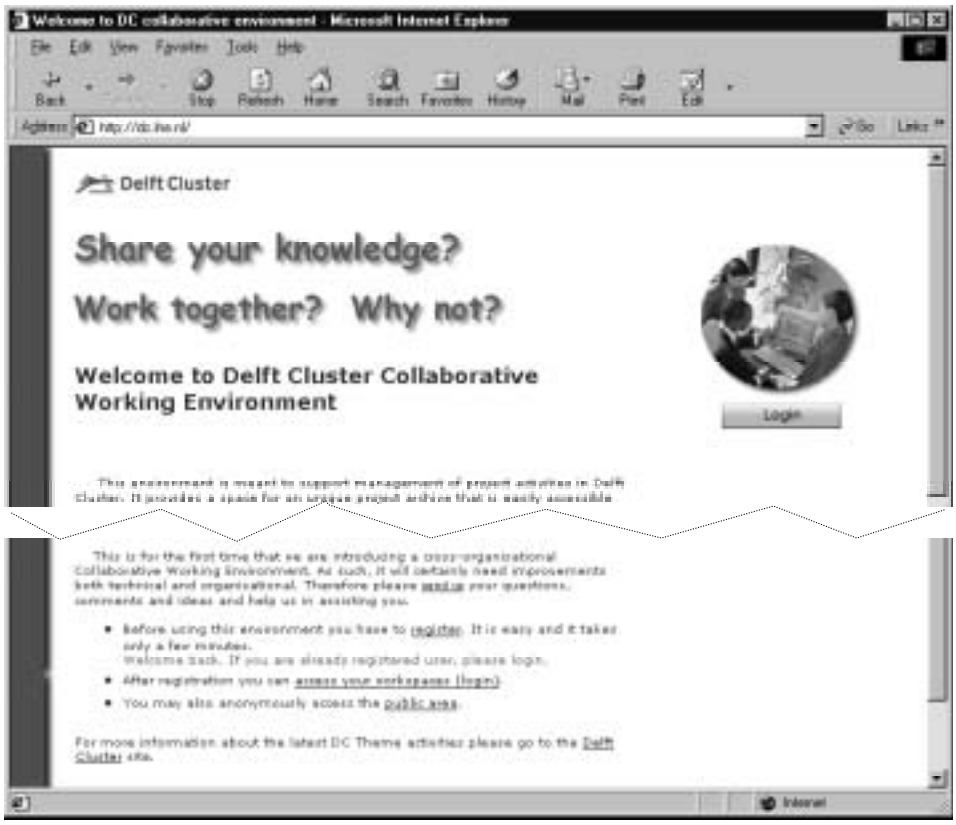


Figure 4: DC Collaborative Environment homepage

The implementation of DC Collaborative Environment started immediately after installation of BSCW. It has been seen as the realisation of a several steps:

1. Development and implementation of a basic environment structure,
2. Assigning authorisation- and access rights,
3. Organisation of collaborative working in Environment (rules, roles and responsibilities),
4. Announcement and introduction of Environment,
5. Facilitating and monitoring the use of Environment,
6. Evaluation and improvement of Environment,
7. Setting up DC Communities of Practice.

The implementation steps are described in the following seven sections of this chapter. The chapter contains two appendices: Quick Scan Analysis (also briefly addressed in Section 5) and Know-Me based analysis of involvement of DC researches in Communities of Practice (see Section 7). KALIF evaluation procedure is introduced in Section 6 and the KALIF Framework in Section 7.

3.1 Development and implementation of a basic environment structure

The basic structure of the DC Collaborative Environment is given in Figure 5; at the highest (Delft Cluster) level, a directory is created for each of the seven Delft Cluster Research Themes. At the same level there is a DC Management directory and a common DC directory composed of News, Archive, Meetings and Discussion Forum. An identical set-up is introduced at lower levels, that is, at the Theme level and the Basis Project level; within the Theme, each Basis Project has got its own workspace and the same holds for Individual Projects within the Basis Project. Management and common directories are created at the Theme and the Basis Project levels.

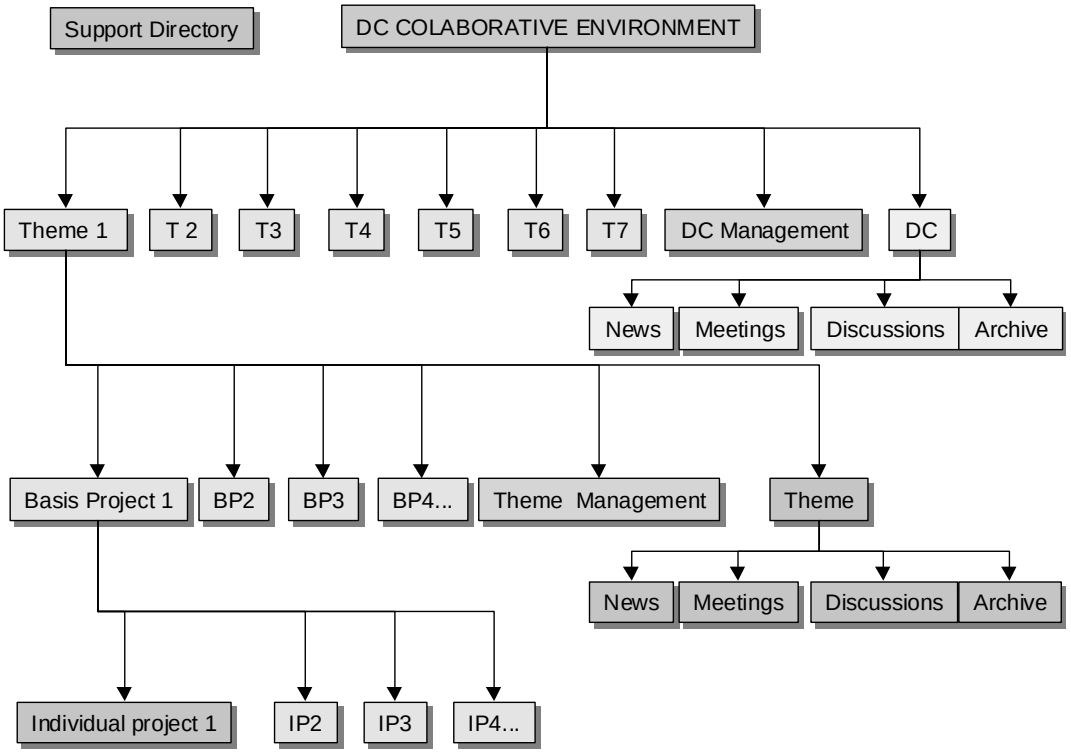


Figure 5: The basic structure of DC Collaborative Environment

This quite simple structure was introduced in order to minimise the start-up threshold for the users. Deliberately, no structure was introduced that would reflect any specific project management procedure. That decision could be at expense of project management; however simplicity and flexibility were considered as the most important requirements of a newly introduced environment.

[The structure could have been elaborated according to a specific project management procedure if this was a company (a single organisation) - and not a cross-organisational environment. Besides, very little is known about project management procedures used by individual DC partners. In an ideal situation, a comparison should be made and this should yield a basis for a common DC project management environment. A work package “Analysis of current ways of working in DC partner organisations” was specified in the project proposal, but never realised mostly because of lack of interest of DC partners to participate in the project.]

The main objective of the DC Collaborative Environment at the time of its introduction was to get DC researchers to use it, not necessarily in the most efficient way. Monitoring the ways in which project teams organise their workspaces (Step 5) should provide valuable information for the improvements of the structure (Step 6), if required. A part of structure of DC Collaborative Environment structure, as implemented in BSCW, is shown in Figure 6.

Figure 6: DC Collaborative Environment structure - implemented

Although placed "outside" of the DC Collaborative Environment, a Support Directory (Figure 7) is an integral part of the environment structure. It contains various kinds of information pieces that the user of the environment might need, such as: BSCW help files and links, *getting started* and *hints and tips* files and information on help-desk support.

Figure 7: Support Directory

3.2 Authorisation and access rights

The basis access right in the Environment is that project members have access to their project workspace and to the common workspaces of their basis project, their theme and at the Delft Cluster level. The decision to introduce this access right was based on remarks made on accessibility in the pilot Environment. In the pilot Environment each member of the Environment (i.e. each DC

researcher) had limited access (read only) to all DC project workspaces. Some users of the Environment found the access to all workspaces superfluous ("too much information, too much navigation") and wanted to have privacy for their own project ("project members and invited only").

Only the leader and co-leader of Theme 7 and a member of DC management in charge of Knowledge Management are authorised to access (read only) all the project workspaces for the purpose of monitoring. Each team leader and co-leader obtained the "ownership" (the full rights) over "their" Theme workspace. Likewise, project leaders became the "owners" of their project places. Each project member is authorised to perform (within her/his own project place) all the operations available in the environment except deleting documents made by others and inviting new members to the workspace. These two operations ("delete" and "invite") could be performed only by the owner of the place (i.e. a theme- or a project leader).

The owner of the place is also authorised to rearrange/restructure the project place (e.g. to rename or remove directories, or add new ones). If co-operation with another project team is needed, the project leader can create a common workspace or make her/his workspace (or a part of it) accessible to the members of the other project team (by granting them limited or full access rights). The team leader decides about access to the management and sounding board directories, while project leaders have control over access to their project places.

An example of access rights originally granted to members of one of the DC Themes is given in Table 1.

Members/Project place (+++ owner; ++ member + visitor)	BP 02.01 Theme management	BP 02.01	BP 02.02	BP 02.03	News, meetings, discussions and archive	Klank Bordgroep
Vrijling11@hotmail.com	+++	++	++	++	+++	+++
E.O.F.Calle@GeoDelft.nl	+++	++	+++	++	+++	+++
Frank.denHeijer@wldelft.nl	++	+++	++	++	++	++
…	…	…	…	…	…	…
P.Waarts@bouw.tno.nl	++	++	++	+++	++	++
P.J.Visser@ct.tudelft.nl	+	+	++	+	++	++
H.G.Voortman@ct.tudelft.nl	+	+	++	++	++	++
J.G.Knoeff@geodelft.nl	+	+	++	+	++	++
c.a.j.vlek@ppsw.rug.nl	+	+	+	++	++	++

Table 1: Access Rights in DC Collaborative Environment (an example)

The last originally introduced authorisation rule was about the use of the Public Space in the Environment. Via the Public Space, documents - but also the whole workspaces - could be made accessible to the anonymous user. This is a handy option for electronic publishing of project results without any effort needing to be made besides changing the status of a document or directory. The DC Collaborative Environment (according to the project proposal) was not meant for publishing project results. In principle, the results should be made available via the DC Intranet (internally) and the DC Intranet (externally). Nevertheless, for the purpose of testing, the "public access" option was introduced to project leaders with the request to contact the administrator prior using it.

Each member of the environment obtained the access to the Support Directory.

3.3 Organisation of collaborative working in the environment (rules, roles and responsibilities)

At the initial stage of development of DC Collaborative Environment no particular guidelines or procedures related to roles and responsibilities were introduced. The main reasons for this were the same as those regarding the structure of the environment (keep it simple, flexible, cross-organisational co-operation, etc.).

Yet, the ways of collaboration and communication with the "outer world" (i.e. other project teams and Public Space) were derived from the access rights. During the workshops (see the next section) it is emphasised that the agreements about roles and responsibilities in the "inner world" (i.e. a project workspace) should be made by the project teams themselves. The role of the DC administrator is to suggest agreements (in order to speed up their making) and to monitor their application. Agreements concerned primarily archiving and communication in the workspace, such as:

- archiving: consistent document titles and descriptions , modification of documents under version control, locking the documents, filling in the project logbook, filling in the news, etc.
- communication: use of e-mail, organisation of meetings (invitations, agendas, discussion material), discussion forums, document related discussions, etc.

3.4 Announcement and introduction of the environment

Two basic approaches to announcement and introduction of the environment were originally considered:

- announcement and introduction (including a workshop) per project team, starting with the teams who have already shown interest in the environment, or
- announcement and introduction to all DC project leaders; they could be trained (workshops) to introduce the environment to their respective project teams.

The latter approach was taken in consideration primarily because of the time constrain; if the environment had to be introduced to all DC project teams, that could not have been done only by the CoPs Team in a short period of time. Bearing in mind the importance of a proper announcement and introduction (a lesson learned from DC Intranet) and the motivation of project teams to use the environment the former approach was chosen. Besides, it was assumed that not all the DC project teams would be interested to participate in this exercise.

The announcement and introduction procedure was as follows:

- a project leader is approached (face-to-face, by phone, or by e-mail) with a brief information on Environment and its purpose;
- the project leader consents to participate and sends to the administrator a list of project team members and their e-mail addresses;
- the project leader defines the access right to be granted to project members;
- the administrator creates a project workspace and sends the first announcement (by e-mail) to the project team members. This announcement contains an invitation to register into the environment and a request to select suitable date(s) (from a date list) for the workshop to be held.
- based on responses obtained from the team members the administrator selects the date for the workshop and sends the second e-mail with information on workshop (date, place and duration).

Workshops were planned for late afternoons (starting usually 16.00) to last one to one and half hours. They are organised as interactive (computer) sections involving each participant in a process of co-operation in a sample workspace. Workshop material was made available via the Environment Support Directory.

During the 2001 about 200 DC researchers and their external project partners were registered in the Environment. In the same period twelve interactive workshops were held at IHE in Delft.

3.5 Facilitating and monitoring the use of Environment

The use of environment is facilitated by Environment administrator(s). The administrator provides (by phone and e-mail) help-desk support regarding technical and organisational logistics. During the period February 2001 - February 2002 about 30 requests for assistance were received. In general, they could be split in two groups:

- hardware problems
- software problems

DC Collaborative Environment server was down four times due to problems with: Internet provider, a power supply, updating of the system (bad timing!) and a diversion of the Environment address by hackers. The server was never out of operation longer than a couple of hours. The server was once (very) slow because of a backup of the system (again bad timing).

Twice the users could not upload documents because of a restriction imposed within BSCW user preferences. The problem was immediately solved but remained unclear what or who imposed the restriction. The other registered software problems were caused by user errors:

- several times users forgot the username and/or password,
- one double registration of an user,
- several times project leaders sent an incorrect user address to the administrator, which caused registration problems,
- a few times users were not succeeding to perform an operation in the Environment because they did not know how to do that or the operation was not available in the BSCW.

Monitoring is seen as the tracking of the activities in the Environment. So-called visits to the Environments were not counted (i.e. number of hits) because BSCW automatically records all the changes being made in the environment, including even opening/downloading of documents. The brief statistical analysis is given below.

The overview of all the operations conducted by DC researchers in the Environment in the period 13.02.2001 - 01.05.2002 is given in the Table 2. This overview excludes the operations (conducted by the CoPs team) related to administration of the Environment (i.e. registration, authorisation, technical support, etc.).

Operation	In Theme 1-6	In Theme 7	Total in DC
Created	651	929	1580
Deleted	78	168	246
Cut	57	185	242
Dropped	64	78	142
Copy	7	17	24
Renamed	128	112	240
Replaced	76	51	127
Changed	95	176	271
Invited	53	171	224
Removed	9	12	21
Confirmed	3	39	42
Declined	5	11	16
Read	1180	863	2043
Total	2406	2812	5218

Table 2: Operations conducted in the Environment (13.02.2001 - 01.05.2002)

In total 5218 operations were carried out, of which 2812 by Theme 7 members and 2406 by the members of Themes 1 to 6. *Read* and *Create* were the most often used operations (2043 and 1580 counts, respectively - see Figure 8). Read count is activated each time if a document stored in the Environment is opened or downloaded. *Created* counts the uploading of various document types, but also creation of folders, links, notes, discussion forums and meetings. Yet, it could be assumed that this operation was the most often used for uploading of documents (see also Appendix A). Operations *Deleted, Cut, Dropped, Copy, Renamed, Replaced* and *Changed* are operations on created objects (Figure 9). Noticeably a very few objects were copied to an another location.

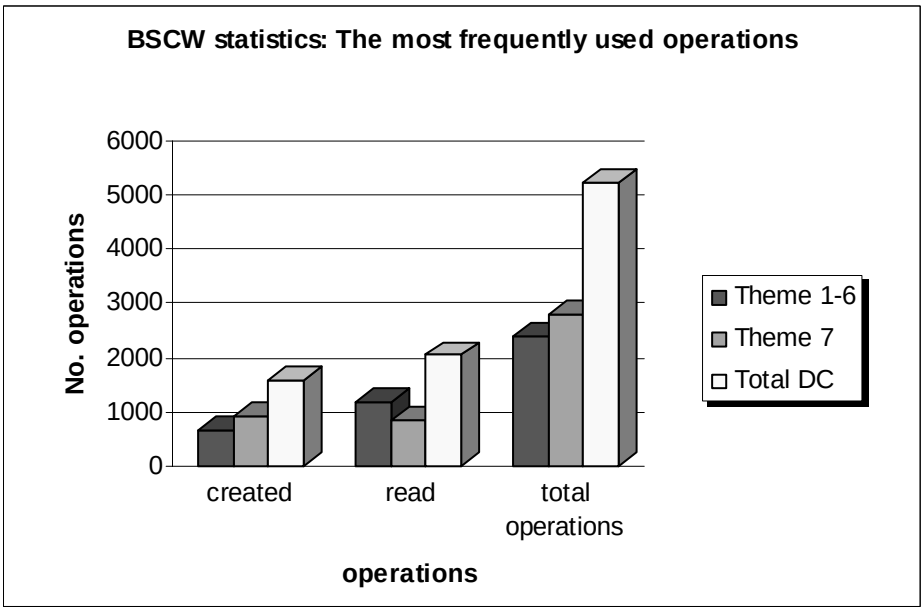


Figure 8: BSCW statistics: the most frequently used operations

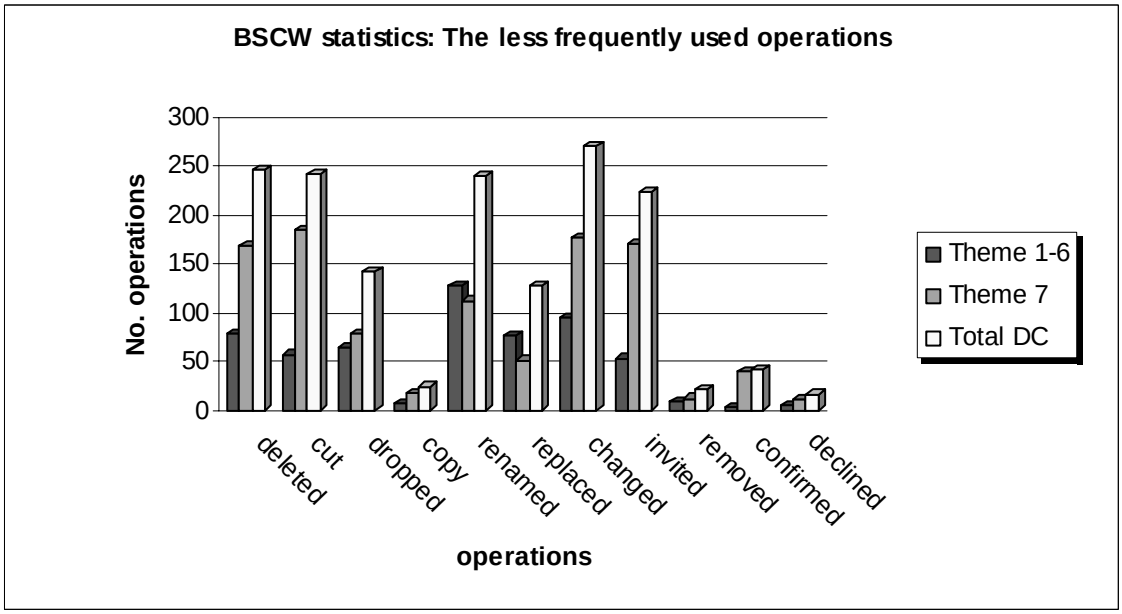


Figure 9: BSCW statistics: the less frequently used operations

Operation *Invited* is very interesting for the analysis of the co-operation in the Environment. DC researches used this operation 224 times to invite new members to their workspaces. As expected, the Theme 7 members were much more active in inviting DC researchers to join their projects than the members of the other six DC Themes (171 versus 53 counts, respectively). A few members were *Removed* from the workspaces, probably due to the outflow of the researchers from the project.

Operations to *Confirm* or *Decline* attendance in the meeting were conducted only 61 times. Accordingly, the Environment facility to organise meetings was not widely accepted among the DC researchers. Apparently, the Environment was most often used for uploading and downloading of the documents, which is also confirmed by the Quick Scan analysis.

As a part of the monitoring, a survey (Quick Scan) was conducted among DC researchers after a several months of using of the environment (October 2001). Results of the Quick Scan Analysis are described in detail in a report attached to this chapter (appendix A). The main figures are listed below:

- Approximately one third of the researchers included in the survey (111 researchers) responded to the Quick Scan,
- About one quarter of respondents was not aware of existence of DC Collaborative Environment ,
- The DC Collaborative Environment is used primarily as a digital archive,
- Most of the researchers use the Environment irregularly.

Quick Scan appears to be a handy monitoring instrument if prepared in a way that minimises the time and effort required to respond.

3.6 Evaluation and improvement of Environment

Facilitation of the Environment, together with the BSCW tracking system and the Quick Scan Analysis provided sufficient data to draw some conclusions on:

- appropriateness of the implementation procedure,
- qualities and shortcomings of the BSCW technological platform.

Yet, no realistic evaluation of Environment can be made without reference to collaboration in DC project teams in general. For instance, if a general activity level in some DC projects is low, no high activity level in the DC Collaborative Environment can be expected. The need for a digital collaborative environment expressed by a several DC project teams (Chapter 1) is most likely not shared by all the project teams. Some project teams are small. In some projects a majority of the team members originate from the same organisation and some projects are composed of mutually independent sub-projects where no intensive co-operation is required. It can be easily assumed that these kinds of project teams did not have use of DC Collaborative Environment high on their agendas. Unfortunately, no analysis has been made on composition and organisation of the DC project teams. Hence their impact on use of DC Collaborative Environment cannot be precisely estimated.

On the other hand, there are requirements to be fulfilled in order to achieve DC objectives. If the main objective of Theme 7 is to foster collaboration among DC partners, then the intensity and quality of (required) collaboration could be monitored and evaluated. For that purpose an evaluation procedure needs to be developed prior to when monitoring is started. Such a procedure is developed in the framework of KALIF (Knowledge and Learning Infrastructure), an EC funded project set up to facilitate knowledge sharing among sixteen EC projects (Kelleher et al, 2001). The KALIF evaluation procedure involves the following items:

- objectives (e.g. improve visibility of projects)
- indicators (e.g. number of presentation on projects)
- performance criteria (e.g. all presentations, formal and informal)
- performance standards (e.g. six at international events)

The KALIF project team developed a matrix (Table 3) for internal evaluation that relates five explicit objectives and four (horizontal) factors to *help assess its impact*, namely: attitude and perception, knowledge sharing, Return On Investment (ROI) and European added value. As the two last aspects were difficult to prove they were combined in a more general objective called *benefits*.

Two of the KALIF objectives are practically identical to the objectives of CoPs project, namely

- optimising knowledge sharing, and
- helping stimulate sustainable communities

These two objectives could be related to steps of the implementation procedure; the first six steps are carried out in order to support *knowledge sharing* in DC projects. Once the projects are completed,

sharing of knowledge will continue in *a sustainable community* (step 7). The first objective could be elaborated further to distinguish the optimisation of knowledge sharing

- within DC project teams,
- among DC project teams and
- with external partners

	Improving visibility	Optimising knowledge sharing	Extraction of Lessons Learned	Exploit CIBIT and ECLO networks	Help stimulate sustainable community
Attitude & Perceptions		X	X		X
Knowledge sharing		X	X		X
Benefits	X	X	X	X	X

Table 3: KALIF internal evaluation matrix

These objectives need to be worked out together with adjacent indicators and performance criteria and standards if the KALIF evaluation procedure is to be implemented in Delft Cluster. Some steps in that direction are made, being described in Chapter 4 of this report.

3.7 Setting up DC Communities of Practice

Communities of Practice often originate from project teams; people who successfully worked together in a project team frequently continue to collaborate after the project is accomplished and the project team disbanded. They tend to form Communities in Practice. The main challenge of Knowledge Management in Delft Cluster is to facilitate this forming process adequately.

In the framework of KALIF project a set of Services is developed to facilitate knowledge sharing in EC projects. These Services could be seen as CoPs Services as well, because they provide a ground for long-term collaboration. The KALIF network consists of three main components:

- people framework,
- IT framework, and
- dissemination framework

Each of these components contains Services provided by the KALIF team. For instance, the KALIF people framework includes various events and meeting opportunities, such as kick-off Knowledge Market, Sharing and Learning Days and Clinics. In the last four years Delft Cluster organised some comparable evens (DC Bazaar, Lunch Seminars) which were certainly useful but insufficient. A set of Services should be clearly defined and incorporated in the DC project management procedure. The services have to reflect not only the needs of the DC researches, but also the requirements necessary for achievement of the Delft Cluster objectives. Accordingly, Knowledge Management Services, such as extraction of Lessons Learned, should be not only a desirable, but also a compulsory, part of the project execution.

The DC Collaborative Environment can be seen as combination of several (mainly technology framework) Services. These Services can be integrated into a concept of DC Communities of Practice and made available in a form of guidelines for supporting collaborative working in DC project teams and emerging Communities of Practice. That was one of the conclusions of an analysis made on current involvement of DC researchers in Communities of Practice (see Appendix B to this chapter). The vast majority of those CoPs are however, neither set up nor facilitated by Delft Cluster. If requested, they should be facilitated, because they contribute to the general DC objectives. Yet, the main task of CoPs Team is to facilitate the DC Project Teams and emerging authentic DC Communities of Practice (see Chapter 4).

4 Delft Cluster CoPs Concept and Services

This chapter begins with a description of DC Communities of Practice concept that has been developed during the realisation of this project (Chapter 5.1). The concept highlights a specific relation between the DC Project Teams and the CoPs in Delft Cluster; this relation has profound impact on the support that should be provided to both Project Teams and the CoPs. Required support activities are presented in this report as a set of services (Chapter 5.2) composed of People Network Services, Technology Framework Services and Dissemination Services. The services need to be further elaborated into "Guidelines for Supporting Collaborative Working in Delft Cluster". Preparation of the Guidelines and their implementation in the next Delft Cluster phase are the tasks for a new CoPs Team. More about the role and responsibilities of this team will be said in the closing paragraph of this chapter.

4.1 Deft Cluster CoPs Concept

The general goal of Research Theme Knowledge Management was to support long-term collaboration in Delft Cluster. In the first project phase DC researchers and their partners have collaborated in Project Teams, carrying out DC research projects. Once the projects are acompleted the collaboration could continue in CoPs by:

- Sharing state-of-the-art-knowledge in the area of common interest (new publications, conferences, products),
- Discussing (structural and ad-hoc) problems and questions posed by fellow CoPs members, public or potential DC clients,
- Preparing new research projects and joint advisory activities.

There are some substantial differences between collaborative working in Project Teams and in CoPs. For instance, a Project Team has always limited duration and clearly specified goals. On the other hand, CoPs are usually described as *informal* groups (for a detailed comparison see a DC project report 07.03.02). Yet, these two basic forms of collaboration show some resemblance, especially if the collaboration has to take a place not only in real, but also in a virtual environment. Besides, CoPs are very often emerging from Project Teams; if a Project Team collaborates successfully, the members of the Team will aspire to maintain some sort of collaboration after the project accomplishment. For these reasons Delft Cluster CoPs are defined as:

Groups of DC researchers and their external partners that share a common interest in a scientific discipline, problem area, research topic or related methods, tools and products.

The "common interest" could be then shared less formally (outside of projects, or in time between the projects) as well as formally (during the project execution). During the last two years several attempts were made to initiate DC CoPs independently of defined research projects. These attempts have not resulted in success due to obstacles such as lack of commitment, internal DC competitiveness and an ambiguous status of the DC "virtual organisation". These obstacles were less present in the DC Project Teams, so a considerable time was spent supporting collaboration in the Teams. The next phase of the Delft Cluster will most likely again be executed in a form of research projects. The purpose of CoPs services (and future Guidelines) is therefore *to support collaboration in Project Teams, preparing ground for the long-term co-operation in Delft Cluster Communities of Practice.* In the Guidelines, primarily those Services ought to be elaborated that are common for both Project Teams and Communities of Practice. Nevertheless, the DC project Ways of Working (WoWs) should be addressed as well, having in mind two important Lessons Learned from the first DC phase:

- The basis project management services have to be available right at the beginning of the Research Programme.
- The basic knowledge management activities need to be incorporated in the project management procedure

Accordingly, the basis project management and knowledge management services should be prepared and made available to DC researchers as one unique set of services.

The services are defined according to the currently used platforms in Delft Cluster (BSCW, DC Intranet and DC Internet); nevertheless, the most of the services are not dependent on technological platform.

4.2 Basic Services

Support of collaborative working in Delft Cluster ought to be carried out through implementation of predefined Instruments or Services. Three basic types of Services can be distinguished:

- People Network Services
- Technology Framework Services
- Dissemination services

These three groups of services need to be worked out into Guidelines. The services are a mixture of "classical" project management WoWs (e.g. document handling, project workflow) and knowledge management instruments (e.g. Lesson Learned, Post Project Review).

People Network Services

DC researchers collaborate in both real and digital environment. Accordingly People Network Services need to be provided on-site (in face-to-face contacts with Community members) and on-line (in the Community digital Environment). The on-line services complement the on-site services; they enable preparation and follow up of the on-site events and make the results of those events accessible to those who could not attend. In other words, on-site events will be announced, presented and analysed using on-line services. On-line services (yet to be further elaborated) will be provided via help-desk, together with the technical support on use of Digital Project Environment (see Technology Framework Services).

The main on-site services are listed below.

Kick-off meetings

The main issue to be addressed during the kick-off meeting is Ways of Working (WoWs). Ways of Working define functioning of the Project Team in terms of project management tasks, external and internal communication and development of the project repository. For instance, internal communication describes information flow and related recording of information in various documents (memo's, notes, reports), in correspondence directory (e-mails, external hard-copies) and in discussion forums.

Ways of Working are to be prepared in advance by CoPs Team as a standard Delft Cluster "template". They will be sent to all Project Team members prior the kick-off meeting and introduced by CoPs Team during the meeting. WoWs need to be discussed by Project Team members. Some parts of WoWs could be altered or augmented in order to match project specifics. The roles (and related responsibilities) need to be assigned as well. Finally the Project Team members should agree upon (commit to) use of WoWs.

Activities defined by WoWs are a standard part of the project execution procedure and therefore compulsory. As such they also have to be budgeted, either as project management activities (e.g. reporting, invoicing) or knowledge management activities (e.g. Project Knowledge Card, Lesson Learned).

Kick-off meeting should preferably be combined with the Workshop on use of Digital Project Environment (a Technology Framework Service).

Some of the items to be elaborated in WoWs are listed below. The items are divided according to main project phases i.e. project preparation, conductance and completion.

Ways of Working (Items)

Project Preparation

Call For Proposals
- Author: DC Management (a general part) and a DC Segment Leader (a specific part)
- Form: Word document
- Location: DC Project Environment/Segment/Call for Proposals
- Distribution channel (e-mail with a DC Project Environment address)
- Distributed by: a Segment Leader
- Recipients: list of recipients (prepared per segment by DC Back Office with assistance of a Segment Leader)
- Contains a link to guidelines/procedure (in DC Project Environment)

Procedure Call For Proposals
- Expression of Interest (deadline)
- Author: DC researchers (project initiators)
- Form: Reply Form (template, MS Word or HTML); items: author co-ordinates, tentative title, segment, participant/partners, estimated costs, etc.
- Conditions checked (regarding author, participants, subject, approach, complies with the segment objectives, etc.)
- A project proposal workplace granted (containing archive for background material, discussion forum and link to a proposal template)
- Promotion of project proposals: 'Looking for a project partner'?
- Project proposal submission, evaluation, possible revision and approval (deadlines)

Project Conductance

Needed beforehand: structure of project environment, procedures (instructions) and templates.

- Project proposal approved (notification, e-mail ADOBE file, a link to project workspace)
- A project workplace created and granted

Procedures
- Document handling (in the environment and externally), e.g. authorisation, consistency requirements (titles, descriptions, key words) documents under version control, etc.
- Communication (in the environment and externally) e.g. e-mails, discussions (topics), meetings and use of common calendar, filling in the news, information flow, etc.

Templates
- Project plan (based on project proposal – Word document)
- Project budget breakdown per activity and per team member, plus the planning and realisation in time (spreadsheet or off-the-shelf software)
- Project meeting notes
- Project log with After Action Review
- Project Knowledge Card
- Progress report (Word document)
- Information flow diagram
- …

Project completion

Procedures
- Project report submission, evaluation, possible revision and approval (deadlines)
- Restructuring the project workspace into a CoPs workspace (project documents remain available – read only, linked via CoPs archive).

Templates
- Final Report, Management Summary,
- Post Project Review
- ….

Knowledge Markets

Delft Cluster has organised one quite successful (Promotional) Knowledge Market during the first DC phase (2001). The Knowledge Markets should be organised more frequently, not having each time the promotion to the outer world as the main objective. Markets are organised to gain insight into each other's work and to develop relationships for further collaboration.

Participants in the market should be enabled to shop around in a structured way in order to find out whether their colleagues could assist them in closing possible knowledge gaps.

Activities around Knowledge Market should be rounded off with an analysis of key sharing items; results of the analysis could serve as input for organising Sharing Days (see below).

Debriefs

Project Debriefs are used for building reflexive capacities in the project by extracting Lesson Learned and Best Practices in various phases of project execution. As far as timing is concern there are several opportunities for structured debriefs:

- Spontaneously; Lesson Learned come up spontaneously; the most important is to record those insights by filling in a simple form and to make it available (via Technology Framework Services) to others.
- After Action Review (AAR); after each task a few minutes are spent to complete the AAR together with colleagues involved in the task execution.
- SMILE (Significant Milestone Review); SMILE can point out a need for additional project meeting to discuss possible revision of project planning, team composition, deliverables, etc.
- PPR (Post Project Review) provides retrospective of the full project period. As such it brings understanding of most important Lesson Learned across the project's lifetime. Besides it focuses on future improvements as an added value of the project.

Clinics

Clinics are customised support to individual Project Teams in a wide range of issues, such as DC procedures (outside of WoWs defined for Project Teams), external publishing, evaluation plans, marketing plans, intellectual property rights, Lesson Learned cycle, etc. Although some of the support will be provided by the DC Back Office, that should be done in close co-operation with the CoPs Team. Clinics could be organised for a several Project Teams jointly. The procedure for each of Clinics provided by CoPs Team (such as extraction of Lesson Learned) needs to be elaborated in advance.

Some of the Clinics are coming directly from activities agreed in WoWs (e.g. Knowledge Mapping, Lesson Learned, External Publishing). The Clinics are not compulsory but the WoWs activities are.

The Clinics should be presented to DC researchers as a useful assistance in conductance of in WoWs specified activities.

Sharing Days

Sharing Days are structured and guided combination of short presentations and discussions between members of two of more project teams organised around common research topic. Common research topic can be the core topic for one Team and peripheral for several other Teams or Communities (see also Figure 12). Sharing Days are seen as a result of WoWs and Clinics (Internal Publishing, Knowledge Mapping, Project Liaisons). If these services are not provided properly, no interest for Sharing Days could be expected.

Sharing Days are not the same as the current DC Lunch Seminars; Lunch Seminars are public free-form project presentations (introductions), followed by a short discussion (see definition of Sharing Days above).

Every Sharing Day needs to be recorded in a consistent manner. It cannot be expected that all the suggestions and ideas generated during Sharing Day find their immediate implementation in the current project. They can however be stored in the DC knowledge bank to be used for initiation of future projects.

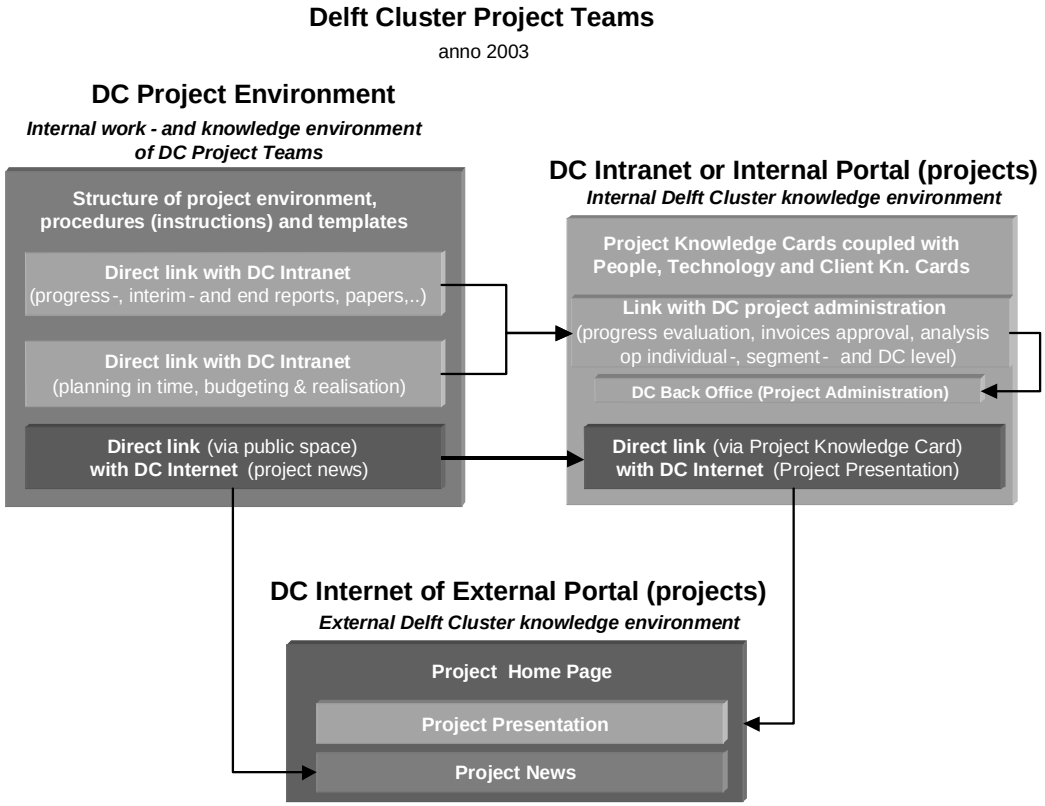


Figure 8: Delft Cluster Project Teams (2003)

Technology Framework Services

These services provide each Project Team with:

- Digital Project Environment (the internal work and knowledge environment of DC project teams)

- Digital Project Dossier (including WoWs and templates)
- Workshops on use of Digital Project Environment (to combine with Kick-offs)
- On-line Help Desk (project and technical support)
- Maintenance of the Environment (user administration, data back-up, software upgrade)

The most important is that each DC Project Team obtains its own work and knowledge place (Figure 8) at the very beginning of the next Delft Cluster phase. The content and the structure of Digital Project Dossier (that is contained in the Digital Project Environment) depend on DC WoWs. An example of Digital Project Dossier is given in Figure 11.

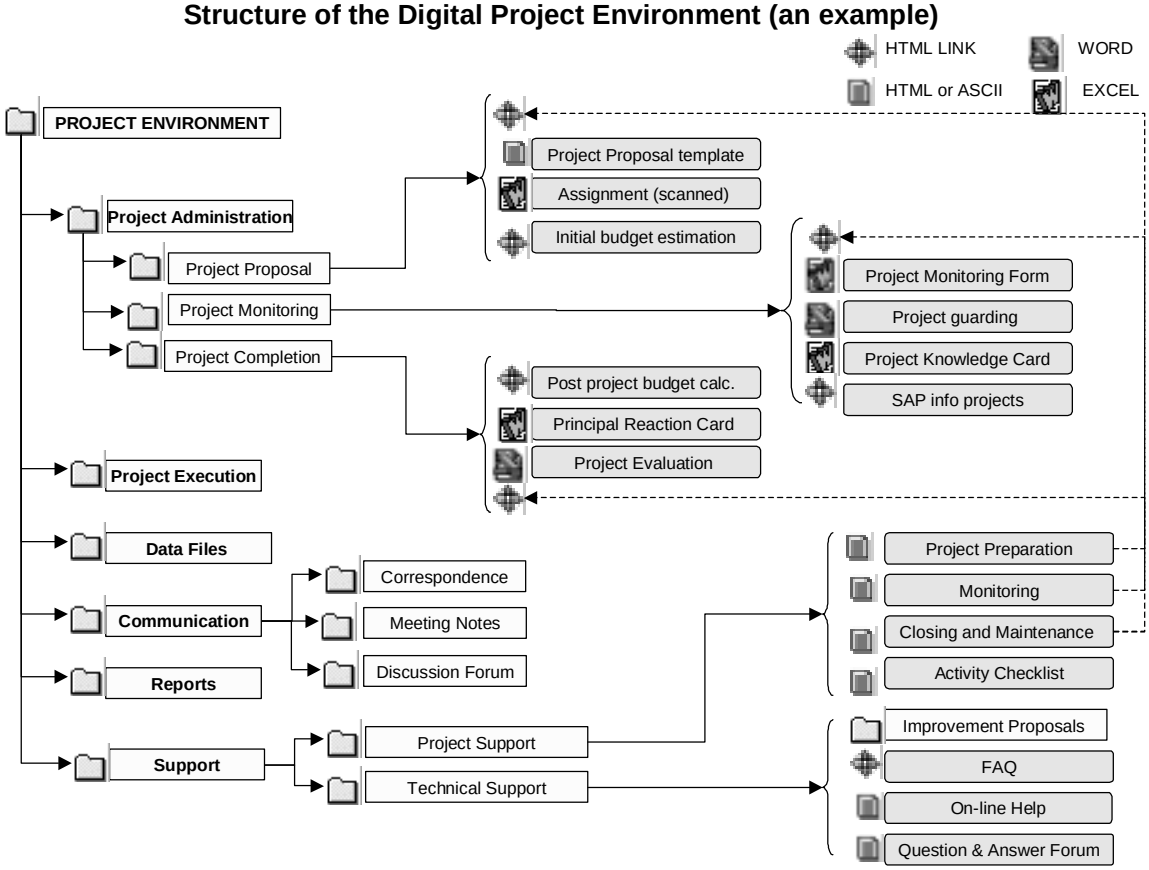


Figure 11. Structure of the Digital project Environment (an example)

The main activities regarding Technology Framework Service will be technical, such as installation, testing and structuring of the Environment, registration and authorisation of DC researchers, on-line assistance, etc. It is expected that these activities will not be too laborious and time-consuming if the current DC Project Environment remains in use. Therefore, the newly-formed CoPs Team could consider an additional service:

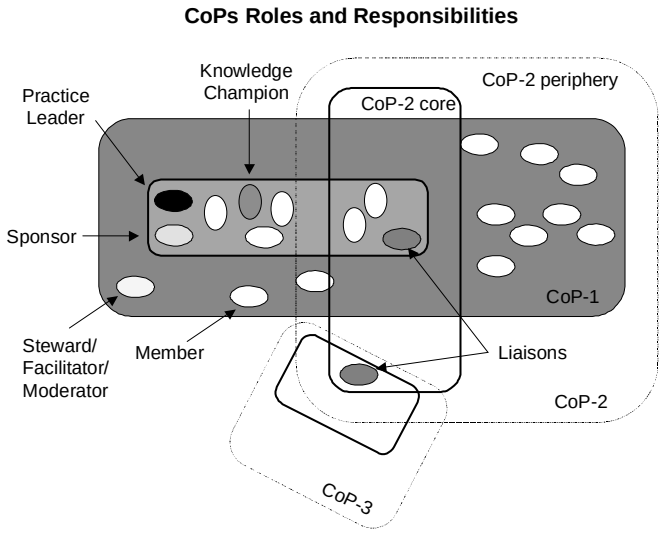
- Development of customised Project Team and CoPs applications (such as Home Pages and databases).

The experience gained in collaboration with external partners (see Chapter 5) pointed out the need for customised applications. Besides, a several project Home Pages have been developed (by DC Project Teams) outside of DC technological platforms. This kind of activities should at least be co-ordinated for a purpose of consistency and reuse of already developed applications. Perhaps a provision of Home Pages for each DC Project Team would be a proper solution (see Figure 10 and the next paragraph). Home Pages on DC Internet and Project Knowledge Cards on DC Intranet should be directly accessible from the Project Team Environment (Figure 10). An adequate coupling among

these environments is also necessary to ensure smooth correspondence between Project Teams and DC Back Office.

Once the projects are accomplished the collaboration will hopefully continue in CoPs (see the DC CoPs concept at the beginning of this chapter). In that case DC Cops will develop their own WoWs on issues such as community type, organisation, repository structure and handling, way of internal and external communication, etc. Possible roles in CoPs are shown in the Figure 12.

The current Project Environment will be transformed in CoPs People Network, as a part of DC Corporate Memory (Figure 13). DC Intranet will make up the other part of DC Corporate Memory, namely CoPs Repository. Finally, DC Internet will continue to serve as a portal to the outer world.



It is not expected that development of a new DC Portal would have any negative effect on suggested Technology Framework Services. On contrary, it can only alleviate their implementation. In any case, Delft Cluster needs an internal, interactive Project Management (and future CoPs) environment, an internal DC knowledge repository and a dissemination window to the world. External dissemination (publishing) is regulated through TU University Press. Dissemination during the project execution will be briefly mentioned below.

Figure 12: CoPs Roles and Responsibilities

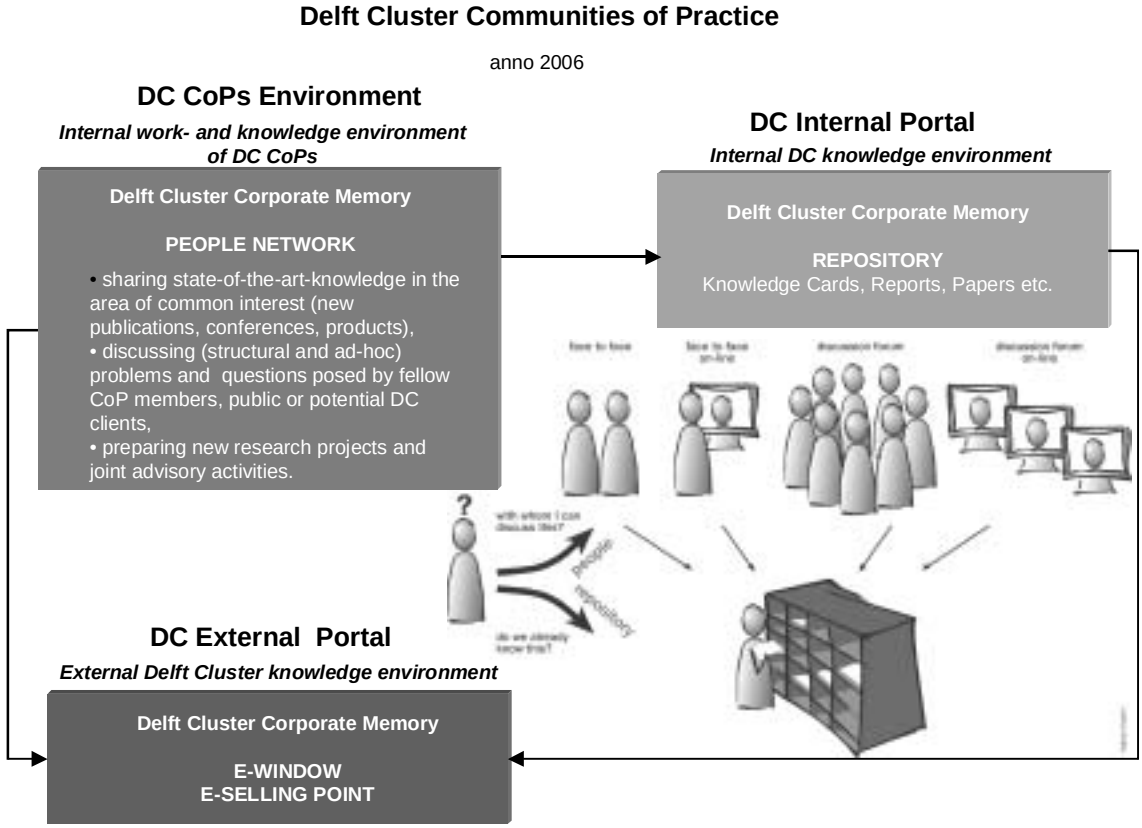


Figure 13: Delft Cluster Communities of practice

Dissemination services

Dissemination within the Project Team and to the DC Back Office should be regulated by project WoWs. Filling in the Project, People, Technology and Client Knowledge Cards is also a part of dissemination process. A part of this information should be made available to the outer world as well (Figure 8). Dissemination during the project execution is crucial for co-operation among project teams. The teams should be able to directly fill in and disseminate interim results ("project news") to other DC project as well as to the GWW sector. That implies an additional "dissemination" service with an authorised communication between various DC technological environments.

Evaluation of Services

Evaluation of Services provides information on collaborative working in Delft Cluster. Evaluation procedure needs to be elaborated for each service individually, by defining service objectives, evaluation indicators and performance criteria (for details see the second CoPs Interim Report.)

4.3 CoPs Team

The main task of the CoPs Team will be to support collaborative working in Delft Cluster. In order to provide an adequate support the Team has to develop Guidelines that are based on suggestions (a concept) provided in this chapter. Development of Guidelines basically means

- Elaboration of basic WoWs
- Elaboration of basic Services (including the evaluation procedure)
- Elaboration of implementation procedure (organisation, roles and responsibilities)

The Guidelines should reflect the WoWs and Services currently used (as well as desired) in DC partner organisations. Therefore the representatives of al five partners need be involved in development of Guidelines. Exchange of experience during the development would be beneficial for individual partner organisations and could lead to improvement of their internal WoWs and Services. Besides, it would bring an additional insight into organisational meta-knowledge that needs to be disseminated via Delft Cluster Knowledge Centre.

The DC partners should fund the Team activities proportionally. At most 20% of the Team activities could be considered as applied research (the rest is a service). The CoPs Team activities should not exceed circa 30% of total workload of CoPs Team members. The limited involvement of one prominent external advisor in the Team would be desirable.

5 Co-operation with the sector

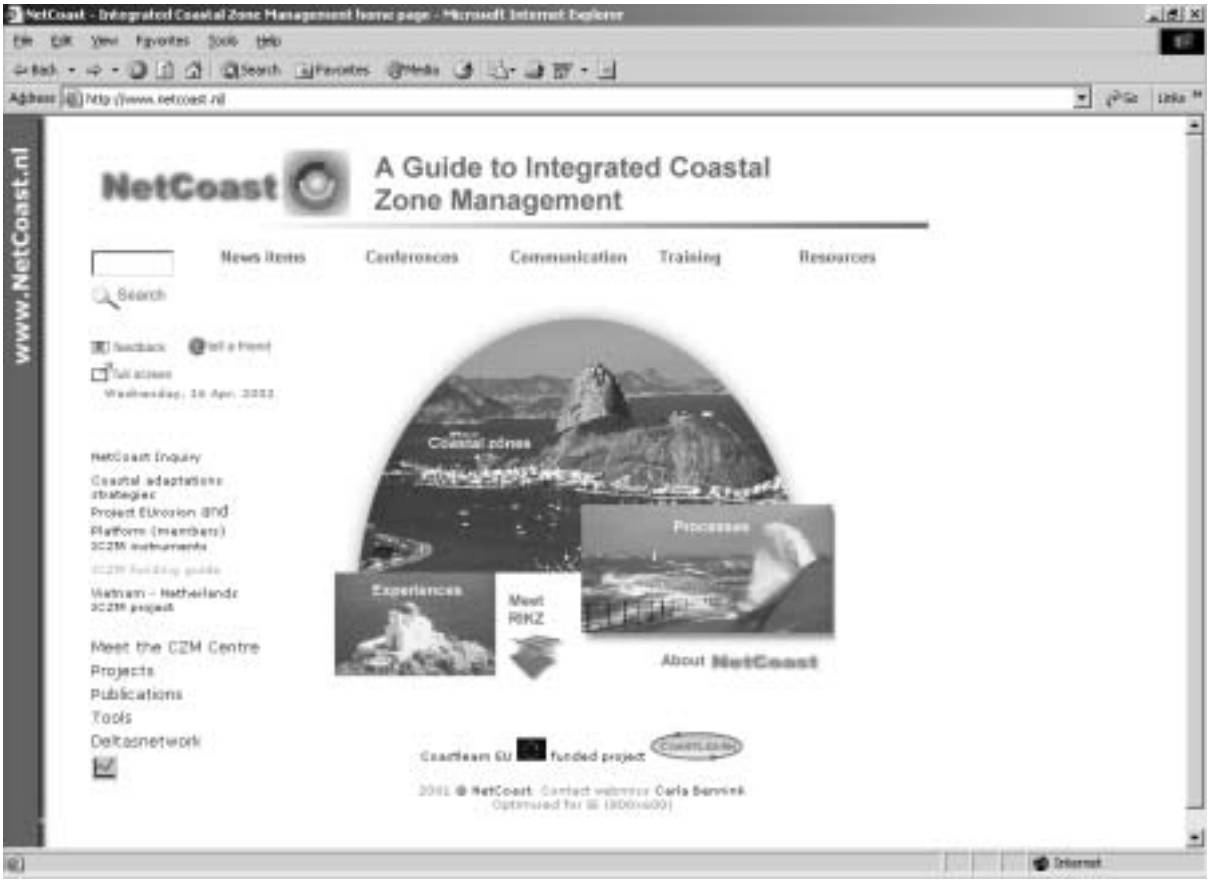
Development of a broad, intensive and indeed successful co-operation with the GWW (Grond Water Wegen) sector was one of the main Delft Cluster objectives. Establishing co-operation between the 'content' DC Themes (Themes 1-6) with the sector was primarily matter of finding topics of common interest in the already shared (GWW) field(s) of expertise. Co-operation between Theme 7 and GWW sector could not be established in the same way due to a several reasons. At the beginning of the Research Programme the Theme 7 had a limited knowledge on knowledge management and could not compete with consultants in this field (such as Cap Gemini or KPMG). The Theme 7 was supposed to implement and/or develop KM instruments (services and tools) specific for the GWW sector. Yet, a majority of KM instruments needed were of a general type (a web site, a database), so the Theme 7 had to complete with KM and ICT consultants. Moreover, the time was required for definition of specific GWW KM applications.

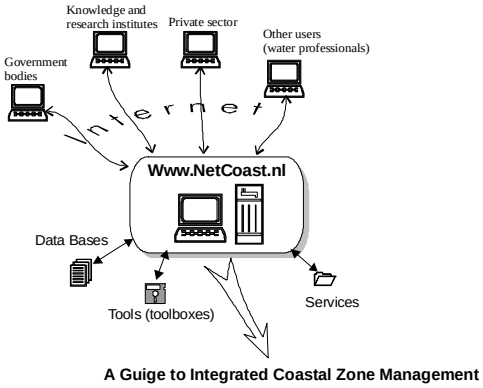
In the project proposal, the collaboration with the sector is envisaged as the application of the - within the project developed – CoPs tools and services. Two partners from GWW sector were actively involved in realisation of these activities: NetCoast (Coastal Zone Management Centre) and the NWP (Netherlands Water Partnership). The co-operation with these project partners is described in continuation of the chapter (Sections 5.1. and 5.2). The main aims of these two work packages were to learn (by prototyping CoPs) how to set-up and facilitate professional water-related communities and to identify certain generic facilities and components of CoPs that can be used for building the generic CoPs basic support environment as a vital part of the future DC Corporate Knowledge Platform (portal). Next to it, a Section 5.3 gives an insight into support provided to the Platform of Hydrological Research in the Netherlands (NHP). This chapter is rounded off with some general remarks.

5.1 NetCoast

One of the main aims of the NetCoast is to become digital "meeting point" where professionals in coastal zone engineering and management would come for the latest relevant information/knowledge, documents, publications, software, links to other resources and for professional collaboration and dissemination of information. Currently, the NetCoast network gather about 1200 international professionals related to the coastal engineering and management world-wide. There are already several existing physical communities 'living' within the NetCoast network and initiative. The goal of this work package was to strengthen up the existing coastal communities and provide them with the proper set of tools and components (CoPs support environment) in order to improve their collaboration activities. From the Delft Cluster perspective, the goals of this work package were: gaining experience in setting up and facilitating such professional communities, reflection of this experience on DC Themes, and identification of generic components and functionalities for building generic CoPs support environment which will serve for the whole DC community. In particular, during the discussions and meetings with other DC members and themes, Theme 3 expressed strong interest in NetCoast communities of practice facilitation and development.

In order to define the functional requirements and the main components for the NetCoast CoPs support environment, several discussion and interviews were carried out between the DC project team members and the representatives from the Coastal Zone Management Center and the NetCoast international members. Email lists together with web-based forms were used to acquire information on the functional requirements from the NetCoast international members. On the basis on this inventory and analysis the following structure with the main components and functionalities emerged, see Figure 14. It is interesting to note that one of the main user requirements was to build a repository of tools (simulation software and modelling systems) which are commonly used in practice for integrated coastal zone management. In addition, a concept-based indexing and search engine was also requested in order to effectively find and access information produced by the different CoPs.





A Guige to Integrated Coastal Zone Management

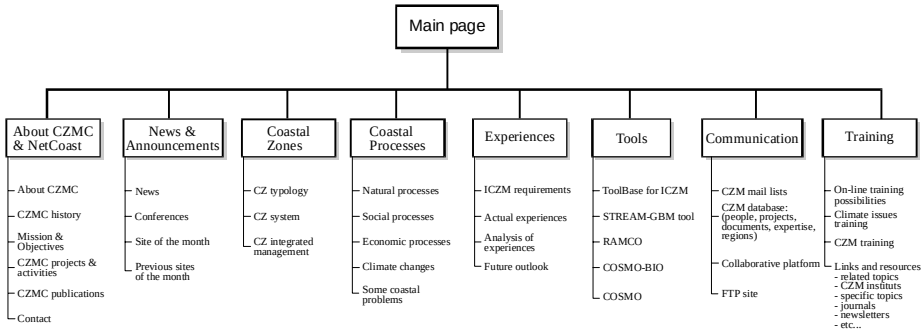


Figure 14: The structure and the main components of the NetCoast portal

On of the key components integrated within the NetCoast platform is the DC collaborative environment, based on the BSCW software. This platform was used to set-up and facilitate two project-based CoPs, namely:

- CoastLearn CoPs, with a main goal of development of educational and training modules (web-based and e-learning) in the area of integrated coastal zone management (ICZM). The following modules were successfully finalised during the life-cycle of this CoPs prototyping workpackage: Principles in ICZM, Policy analysis, GIS for ICZM, Spatial planning and Environmental risk assessment module. These modules are accessible via the NetCoast site at:
  http://www.netcoast.nl/coastlearn/website/index2.htm
- EuRosion CoPs, with a main goal of development of European coastal erosion policy guidelines and recommendations. This work of this community resulted in development of a prototype database visualising existing information such as administrative information: terrestrial and marine administrative units, physical information: infrastructure, hydrographical features, elevation and bathymetry, land cover, coastal erosion, hydrodynamics and sea level, sediment flows from river basins and socio-economic information: population, economics, driving forces, and coastal reporting. The work of this CoPs is available in the DC CoPs collaborative environment (http://dc.ihe.nl).

The ToolBase repository of tools especially developed to facilitate the NetCoast CoPs contains detailed information for more than 40 tools. In addition, an interactive visualisation tool was developed in order to advise the different researchers in the area of ICZM which tool is suitable to their specific problem, see Figure 15.

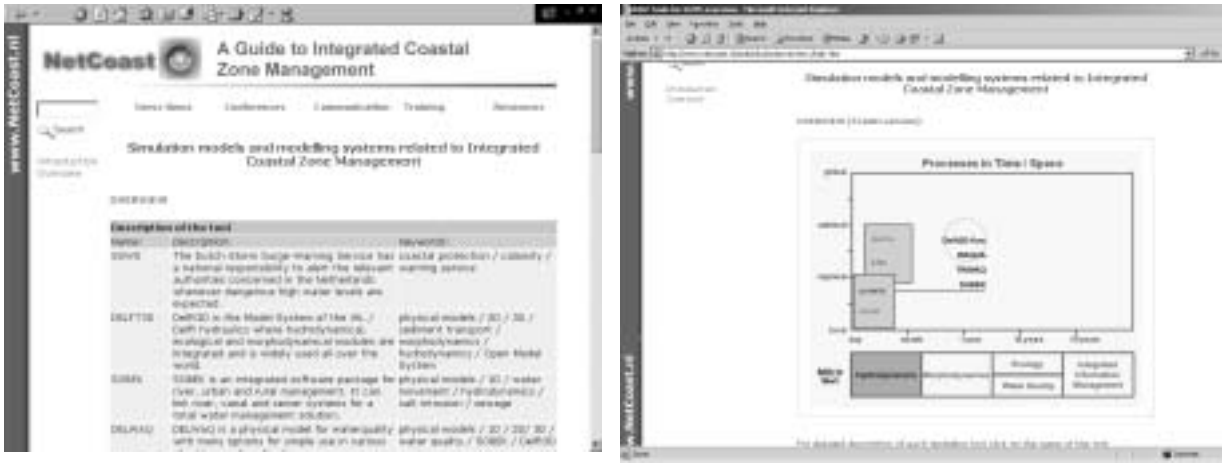


Figure 15: The NetCoast ToolBase component

During the setup and facilitation of the NetCoast CoPs different kinds of support was provided by the Delft Cluster project team ranging from prototyping and tailor-based development of certain components to CoPs facilitation, on-line guidance and hands-on training activities. The work activities and the patterns of communication of the different NetCoast CoPs was monitored by using the tracking and reporting possibilities of the DC collaborative environment and periodic enquiry and evaluations. An important feedback received from the members of the NetCoast CoPs was the request to the facilitators to summarise the weekly activities of the communities. With the migration of the BSCW software from version 3 to version 4, which served as a basis of the DC collaborative platform, this request was partially supported by the new functionality of generating automated reports for the activities that took place within particular workspaces in the different CoPs.

5.2 NWP

The Netherlands Water Partnership (NWP) is an independent non-profit umbrella organisation which gather more than 110 member organisation from the Netherlands. The main aims of the NWP are to harmonise the activities and initiatives of the Dutch water sector and to undertake world-wide promotion of Dutch expertise related to water, as one of the leading countries in the sustainable development in densely populated delta areas. The vision of the NWP is to become a focal point for the exchange of information related to activities and services of government bodies, knowledge and research institutes and businesses involved in the water sector. In order to achieve this, among the other activities NWP aimed at establishing so-called Water Information Network (WIN) with the main objective to share and disseminate among different communities the existing water experience and best practices. From the DC point of view the WIN is very similar to the corporate information repository that needs to be developed for the DC Corporate Knowledge Platform. Therefore the main goal of this work package was to gain conceptual and technical experience in structuring and building such a corporate information repository (information/knowledge base) as a basis for sharing and disseminating of information and knowledge between different Communities of Practice. In addition, existence of such information repository is seen as a critical driving mechanism for emergence and formation of new water-related Communities of Practices.

Taking into account the main objectives, mission and the activities of the NWP including the co-operation with Delft Cluster, and the preliminary analysis of the functional and non-functional requirements of the WIN, the proposed simplified general structure of the WIN database is presented in Figure 16.

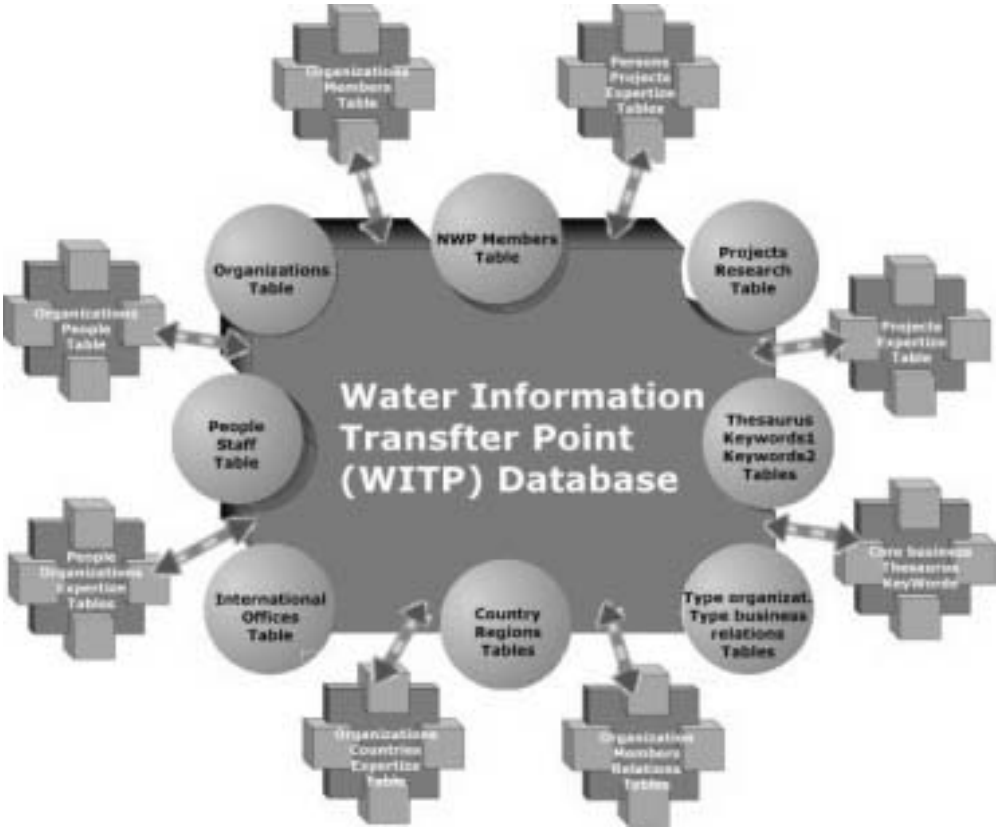


Figure 16: The general structure of the WIN database.

This concept and design was implemented into a web-based information system by a professional web development company. The system offers a user-friendly interface for efficient search and access of information related to the GWW sector, see Figure 17. Furthermore, the content management of the

system is completely web-based. The central entity in the system is the database of more than 800 people, which contains information on their expertise (knowledge cards), related organisations and projects, case studies, products and tools and associated CoPs.

Figure 17: The web-based interface of the WIN.

The most important part of the WIN system is its capability to link people with similar profiles and areas of expertise, thus providing a platform for creation of communities of interest and further communities of practices. The DC collaborative environment is used to support the collaboration between the possible emerging communities. From the feedback and the discussion with various users from the Dutch water sector, it is interesting to note that most of the users requested off-line availability of such system. This resulted in development of a prototype system, termed as WinTop, as a stand-alone CD version of the WIN. One of the main lessons learned from the development of the WIN as a base for the CoPs formation was the need for facilitators who will be able to summarise and synthesise various information to be communicated to the water sector. Although the system allows for automated context-based alerting and notification, people do usually ignore the automated emails generated by the system. Thus the importance of facilitators was strongly stressed.

5.3 Platform of Hydrological Research in the Netherlands (NHP)

NHP is founded by several universities and research institutes in the Netherlands in order to enhance collaboration among researchers in the field of hydrology. The platform is particularly aimed for Ph.D. researchers and their mentors. When the first contact with one of initiators of the platform (P. de Laat) was made, NHP was not more than an initiative; till then, representatives of involved research institutions held a few meetings, producing founding documents and defining the requirements for implementation of the platform. One of the main requirements was a provision of common digital place where the input for collaboration (ideas, initiatives, proposals) as well as the results of the collaboration could be shared and disseminated.

The purpose of NHP and its anticipated way of collaboration are apparently in accordance with a definition of DC Communities of Practice (as given in Chapter 4). A common digital place (as requested by NHP) was in terms of DC CoPs Services a digital Community Environment. Such an environment consists basically of three elements, each of them having a specific purpose:

- A public space: introduces Community and promotes its activities to the public and potential clients,
- A collaborative space (members and invited only): provides communication means and a common digital repository,
- Additional tools and services developed for or built in the Environment in order to support Community activities.

This concept was used to define the components and structure of the NHP environment. The environment consists of the following components:

- NHP introduction
- News and Events
- Participating Organisations
- Research Programme
- People, and
- Collaborative Environment

Figure 18: The NHP platform.

Each of these components could be reached from the NHP Home Page (Figure 18, http://nhp.ihe.nl). All the components besides the last one (Collaborative Environment) are a public space (domain). NHP Introduction gives a brief overview of NHP objectives and the ways of working. News and Events are integrated with the BSCW platform so that new pieces of information placed in BSCW by NHP members could be accessed via NHP platform without changing the News and Events HTML page at all. Moreover, a non-member could submit a new piece of information as well; a NHP facilitator could subsequently decide to add this news to the News and Evens simply by clicking on the button 'publish' in BSCW. The component Participating Organisations provide www links with the sites of participating organisations and the component Research Programme contains extensive descriptions of: NHP Research Programme, Breakthroughs in Hydrological Research and Hydrological Research at Members Organisations.

Figure 19: The People component in the NHP platform.

The component People is an additional Community tool. It contains information on NHP members such as co-ordinates, expertise, research topics of interest and project abstracts (Figure 19). The component is interactive, enabling the members to fill out and/or update their cards. While registering for the first time, NHP researchers are asked to provide a login name and a password. These data are subsequently used for member registration in the Collaborative Environment. Finally, the People database could be searched on members (surname), participating organisation and on keywords (hydrological research fields and problem areas).

Figure 20: The NHP collaborative environment

Collaborative Environment is a digital space meant for collaboration among NHP members (see Figure 20). It provides communication means as well as a common digital repository. Unfortunately, the Collaborative Environment has never been used in a structured way. Information on NHP Community Environment was sent to participating organisations with a request for registration; this resulted in registration of circa 70 NHP members. Yet, nothing was done to initiate collaboration in the Environment. CoPs team was very keen to continue and extend facilitation of NHP Community by implementing People Network Services (see Chapter 4). However, the participating organisations apparently did not have NHP high on their agenda. They found the idea of NHP interesting but were not ready to commit to its realisation. Some additional possible reasons for inactivity of NHP Community are described in the final report on Knowledge Sharing in DC CoPs (Soekijad et all, 2002).

Despite of the fact that attempt to set up NHP Community has not (at least so far) been successful, the CoPs team development of the Community Environment is seen as a success. Digital Community Environment is one of the conceptualised Technology Framework Services of DC CoPs and NHP case was the first implementation of the service. Of course, this single service alone could not provide full support to a community in forming. If the other conceptualised DC CoPs services were implemented, the chances for success of NHP Community would have been much higher.

5.4 General Remarks

As already described in the introduction of this chapter, the collaboration with the GWW sector was envisaged as the application of the CoPs tools and services. The approach adopted was to learn how to set-up and facilitate professional water-related communities and to identify certain generic facilities and components. Two partners from GWW sector were actively involved in realisation of these activities: the Coastal Zone Management Center and the Netherlands Water Partnership. In addition, several universities and knowledge institutes were implicitly involved in the start-up of the Netherlands Hydrological Platform (NHP). The main conclusions resulting from this workpackage - co-operation with the sector - can be summarised as follows:

1. The development of the NetCoast platform supporting CoPs in integrated coastal zone management was successfully finalised. The NetCoast platform is fully operational and currently supported by the Ministry of Transport, Public Works and Water Management. Two project-based communities were setup and facilitated in this process and they are continuing their activities after the finalisation of the first phase of the DC programme.
2. The prototype development of the Water Information Network for the Netherlands Water Partnership has demonstrated the importance of having a solid information repository as a basis of emergence and formation of various Communities of Practice. The information provision proved to be the first necessary step towards further knowledge generation and sharing. The platform is fully operational and appreciated within both, the Dutch and the international water sector. This platform has future served as a basis of the International Seminar on Human and Water (In)Security held in 2002 and planned for 2004 for more than 120 international students based in the Netherlands.
3. The initiation of the NHP platform to support the NHP community was completed successfully. However due to lack of the support from the NHP member organisations, this Community did not really fully materialise.
4. The Delft Cluster collaborative platform based on the BSCW software proved to be a flexible support environment for collaborative working and especially the possibility of its integration with other platforms. The feedback from the users on the functionality offered by the DC collaborative environment was also positive.
5. One of the key components in the developed systems supporting CoPs is the availability of database (information repository) of people / researchers and consultants in the GWW sector. In addition an appropriate and effective search functionality is a key factor for usability of the developed systems. Facilitation of the various CoPs appeared to be one of the important factors for stimulating the co-operation and collaboration between the members. Any future Delft Cluster portal linking various CoPs from the DC organisations and the GWW sector should properly account for the time and support of the CoPs facilitators.

6 Collaborative Multimedia Tools

6.1 Videoconferencing

6.1.1 What is videoconferencing

Basically, video conferencing is like using the phone. However, one can not only hear the other person(s) but also see the other person(s). Not only is it possible to communicate like being in the same room, but also it is possible, throught application sharing, to work on the same document. Using videoconferencing will help people to work more effectively because visual communication is the most natural form of communication. When using visual communication, people understand faster and remember better what is shown.

Video conferencing systems can be designed to large groups of people to join a meeting at distant locations. Others are designed to allow a small group of people discuss important issues from their desks. The feeling of being together will create an environment where decisions are made faster and knowledge and inspiration can be transferred between colleagues. Stronger teamwork and more focus is the result, while no travelling is needed.

6.1.2 Benefits of videoconferencing

A number of benefits of videoconferencing is listed here, ranging from ‘hard’ benefits that can be measured to ‘soft’ benefits that cannot be measured, but are still considered important.

Hard benefits:
- Reduced costs since travelling is no longer necessary
- Less time consuming for the same reason
- More effective since the most important people and most vital information become easier accessible

Soft benefits:
- Improved communication since people meet more often
- As a result of that, faster decision making

6.1.3 Types of videoconferencing systems

Desk-top systems
Desk-top systems are a combination of a powerful computer or laptop with a high quality camera, a fast connection (ISDN, LAN) and videoconferencing software. Usually when you buy a desk-top videoconferencing system you will get a hardware card, camera, headset/handset, microphone & speaker and system software. Also there are desk-top systems that are designed to work with commercially available software like Netmeeting.

Desk-top systems are mostly used by particular individuals in the office, or by people working remotely (at home, for example). Desk-top systems are capable of multipoint videoconferences, but in most cases they are used for point-to-point applications.

Set-top systems
Set-top systems include all hard- and software necessary for videoconferencing in small units that can be placed on top of a TV set. The unit is portable and offers easy plug and play install features. In addition to the units, only the appropriate number of TV sets and an ISDN or LAN connection are

necessary to initiate a videoconferencing meeting. Usually the set-top systems come with remote control and all necessary cables.

In most cases set-top systems are often used within companies or departments among larger groups of people. The disadvantage of set-top systems to desk-top systems are that they are stand alone. No computer is necessary, making it impossible to share computer applications and computer documents.

Group systems
Group systems are solutions for a broad range of videoconferencing needs and are usually integrated into a meeting room. Group systems can be defined as one wishes and can incorporate audio systems, additional cameras and computers to allow collaboration and file exchange.
Group systems usually consist of a codec, a camera, an audio unit and remote control. Group systems can be used by any small or large group of people. The advanced features and unlimited possibilities cause the group systems to be the most expensive videoconferencing systems.

6.1.4 Types of conferences

Point-to-point conferences
This type of conference only involves the connection of two videoconferencing systems, similar to a phone call.

Point-to-multipoint
In this type of conference one priority site is broadcasting to other sites, that can interact and ask questions. This type of conference is therefore often called 'broadcast' mode. A multipoint conferencing unit (MCU) is necessary for this. Some videoconferencing systems have this built-in, for other an external MCU has to be reserved. A typical example of a point-to-multipoint meeting is a training session or an announcement by the president of a company to its employees.

Multipoint-to-multipoint
Here, there is no priority site and all sites are equally ranked. Also in this situation an MCU is necessary. The advantage of a built-in MCU is that no MCU has to be reserved, which saves money and puts no time limitations on the meeting.

6.1.5 Technical issues

The most widespread network for videoconferencing is ISDN. It is almost global and has proven quality and reliability for years. It offers a channel data width of 64 Kb/s and in terms of guaranteed data rates it is the safest medium to transmit videoconferencing signals. Grouping several 64 Kb/s cables data rates of 384 Kb/s can be reached. ISDN works through the H.320 standard, which are switched networks.

Recently the use of IP technology in data transfer has come up. This is this case for systems that use LAN's and the internet for communication, making use of the H.323 standard. Even though the H.323 are quite new and unproven, most analysts predict the IP standard to be dominant in the future. Therefore, most systems are H.323 compatible. In buying a videoconferencing systems, it is vital to check whether the videoconferencing system is compatible with the Data transfer standard between the different locations.

6.1.6 Demands defined in DC-CoPs

Certain demands on the video conferencing systems have been defined in the DC-CoPs project:

- The system should offer the possibility to view video and hear audio at different locations with a group. This requires a system containing an MCU (software or hardware).

- People participating in the videoconferencing sessions should be able to do so from their desk. This requires a desk-top videoconferencing system
- The videoconferencing system should offer possibilities like application sharing and file transfer. Awareness is preferred, yet not a specific demand.
- Communications between the different people occurs through IP based connections and LAN's. This requires an H.323 compatible videoconferencing system.

As a result of this an overview is made of available desk-top videoconferencing systems that enable group-to-group videoconferencing and that are H.323 compliant.

6.2 Overview of videoconferencing systems

IPNexus

Product information
IPNexus is a complete set of IP network based collaborative software. Its main features are:

IPQuickNotes: fast messages using "sticky notes" to other users. The notes can be converted to instant messages.
IPQuickPoll: offers the functionality to conduct surveys among other users
IPMessenger: Secure instant messages like in ICQ or MSN messenger
IPSnapShot: Take snapshots and send results
IPAppShare: Share applications or selected desktop sections with others
Email
File Transfer: Transfer files using FTP protocol
Optional Add-on modules are:
VOIPNexus: Communicate with Voice over IP
VCIPNexus: Invite other users for a one on one or multi user videoconferencing session
SMIPNexus: Broadcast streaming media live to other users

Some screenshots are listed below:

<table>
<tr>
<td> 
</td>
<td> 
</td>
</tr>
<tr>
<td>IP conferencer offering list of online users and means of communication</td>
<td>Video Conferencing window</td>
</tr>
</table>

In general IPNexus can be used as a videoconferencing software tool in two modes:

- With a VCON family camera, such as VCON Vigo, IPNexus becomes a hardware accelerated conferencing client with business quality. Frame rates in video conferences can be up to 30fps.
- With an ordinary USB camera, IPNexus is a software only solution, with all videoconferencing features. Frame rates can also be up to 30 fps.

Purchasing Information

IPNexus is developed by Brinckmann & associates. VCON (www.vcon.com) sells a version of IPNexus customized to be used with their MXM product. Both products can be purchased from Brinckmann & Associates. IPNexus can only be purchased and is not offered as a trial version. IPNexus is available as a software tool or as a software/server tool, running on any local network. It is suitable for n to n videoconferencing.

The pricing of IPNexus server/client license that depends on the maximal number of users is as follows:

Max. number of users	Price
10	$1,350
25	$2,700
50	$4,500
100	$7,500
250	$13,500
500	$20,250
1000	$23,500

Pricing of the Videoconferencing add-on ^{VC}IPNexus is as follows:

Number of users	Price
10	$900
25	$2,250
50	$3,375
100	$4,500

This full-featured H.323 client application is developed for use with the VCON family of desktop videoconferencing hardware, such as the Mediaconnect 6000 series (http://vcon.com/prod.html/mediaconnect/mc6000.html), making it a very expensive solution.

When using IPNexus software with VCON hardware, for example the VCON VIGO camera with accompanying software will have to be bought at $699. In total, when maximum number of 10 persons take part in the video conferencing session, $2949 has to be paid.

When using IPNexus as a full software client only a standard USB cameras and headsets have to be bought. This will cost $2250 plus the price of the cameras and headsets.

Final Judgement

Pros: Nice Graphical User Interface, large amount of features, perfectly suited for use in a virtual collaborative environment because of all additional features like instant messaging and application & desktop sharing.

Cons: Only compatible with specific hardware, therefore very expensive.

Videum Conference Pro

Product Information

On the website of Winnov, Videum Conference Pro is described as “Complete Internet video conferencing kit for Windows-based desktop PCs”. The package consists of the Videum™ AV (PCI) board with the Winnov Color Video Camera. Also a CD is included containing the necessary software and drivers. Videum™ Conference Pro can also be used for video/audio/image capture, Web cams and streaming Internet video. All hardware and software together offers all that is necessary to make one desktop PC suitable for taking part in videoconferencing sessions.

Its main features are:

- Video Conferencing:
  - Highest quality and performance video for video conferencing - superior to parallel port and USB cameras
  - Full-duplex audio for video conferencing - hands-free operation
  - High resolution CCD video camera with integrated microphone - no external microphone required
  - Local and remote camera control (brightness, saturation, hue) as well as digital pan, tilt and zoom via Videum Zoom applet
  - Digital pan, tilt and zoom (using any camera) via Videum Zoom applet
  - Works with any communication device: LAN, ISDN, modem, DSL or cable modem
  - Works with all video conferencing protocols (H.320, H.323, and H.324)
- Video and Audio:
  - 640x480 pixels , 320x240 at 30fps video capture
  - 640x480 pixels at 16.8M colors still image capture or scan
  - Integrated audio capture (8KHz-48KHz sampling) - no sound card required (compatible with existing sound card)
  - Fully synchronized audio with video capture
  - Hardware video compression (up to 12:1) for saving to disk drive
  - Video compression (up to 48:1) for saving to disk drive
  - Scaleable video window size (80x60 to 640x480 pixels)
  - Full-screen live video on DirectDraw-capable graphics cards

The CD that comes with the hardware contains all necessary drivers and Windows compatible software. For representing the live video images, Microsoft Netmeeting is included. The combination of hardware and software however does enable 640X480 pixels video imaging.

Purchasing Information

The complete Internet video conferencing kit for Windows-based desktop PCs can be bought online for $359. This is the price per endpoint. For videoconferences including more than 2 endpoints, a videoconferencing server is necessary. Winnov recommends using the IBM Lotus Sametime videoconferencing server. The server software is freely downloadable from www.lotus.com or can be purchased for $ 421 per end user.

Additional product information of videum conference pro can be found at:
http://www.winnov.com/products/collaboration/vidconfopropci.htm.
Additional product information of Lotus Sametime can be found at:
http://www.lotus.com/products/lotussametime.nsf/wdocs/homepage

Final Judgement

Pros: Not very expensive.

Cons: This product is basically a complete hardware set to enable satisfactory videoconferencing using Microsoft Netmeeting, enabling all Netmeeting features on virtual collaboration like application sharing, whiteboard and messaging can be used.

Polycom ViaVideo

Product information
Another desk-top video conferencing system is offered by Polycom. Basically it is a set of hardware components and appropriate software to transform an ordinary desk-top PC into a videoconferencing unit. The ViaVideo system consists of a high quality camera with built in microphone & headsets port. It also comes with an installation disk of software. No additional hardware is necessary, and installing is done in minutes.

Its main features are:
- Supports IP based H.323 communication over LAN, DSL & Cable networks
- Integrated Microsoft NetMeeting allows for application sharing, file transfers & chatting
- Clarity by Polycom™ technology provides full duplex digital audio with background noise suppression and echo cancellation
- Suitable for MCU Videoconferencing. This is done by creating an address list and simply dialling a number from the list.
- Full-motion video, full-duplex audio and data collaboration

Purchasing Information
The product can be bought online (http://www.skccom.com/1.888.734.4438/polyvideo/vs-viavid.htm). Its costs are $ 599. A Laptop/flatscreen mountable clip costs $19.95. To enable multipart video conferencing an additional hardware MCU has to be purchased at a price of approximately $30,000.

Final Judgement

Pros: Two way firewall support, high quality video and audio. Easy to use, high quality desktop video conferencing product.

Cons: Very expensive when video conferences with multiple parties are desired.

IPContact v5

Product information
IPContact is part of the Powerplay videoconferencing system by Numerex, Inc. IPContact is a videoconferencing system that can be bought with or without PC. It comes with a camera, caption card and dedicated IPContact software. No additional hardware is necessary because IPContact software has an MCU built in, allowing full decentralized 4-way continuous presence multipoint video with 8-way continuous presence audio. Since IPContact comes with its own dedicated software no interfaces to Netmeeting or other videoconferencing software is necessary.

Its main features are:
- H.323 supported, enabling videoconferencing over IP and LAN.
- MCU videoconferencing with up to 4 endstations enabling 30 fps bitrate all the time
- Application sharing (any Windows software) and file transfers
- Remote Video camera control (tilt, pan, zoom)
- Ability to create a contact list through the Call Manager

Some screenshots are shown below:

Call Manager

Display of four sites

Purchasing Information

IPContact can be ordered from the website of Broadband Networks, which is a subsidiary of Numerex. (http://www.bnisolutions.com/Products/Powerplay/index.html)

The price of the software, including PC, camera and capture card is about $ 10,000 per desk-top. At the moment IPcontact can not be purchased as a software tool alone.

Final Judgement

Pros: IPContact is offered as a completely turnkey solution. All is included: PC, hardware and software. This makes using and installing the product very easy, and will give no compatibility problems with other users of the product. Also firewalls offer no problem.

Cons: Because of the fact that IPContact is offered as a complete solution, PC's already in use become superfluous. This gives large additional costs. The product itself is very expensive as well.

OnWan 340 IP desk-top videoconferencing

Product information

Onwan 340 IP is another desk-top video conferencing system, which uses the H.323 standard for transmitting data over IP. It comes with an codec board and software and a camera with microphone. Also software is included, being Onwan's application, DirectX, Internet explorer and Microsoft Netmeeting.

Its main features are:

- Chat feature
- Drag and drop file transfer
- Application sharing and whiteboard facilities through Netmeeting
- Video capture and display snapshot
- MCU ability
- Far-end camera control

Purchasing Information

Onwan 340 IP can be purchased online for $999 per desk-top unit at the following internet site: http://picturephone.com/products/onwan_desktop.htm. To allow multiparty video conferencing, an additional MCU has to be purchased, for example the Radvision H.323 MCU at a price of nearly $19,000.

Final Judgement

Pros: Allows online collaboration using chat, application sharing and file transfers. Uses Netmeeting, thus no incompatibility with other Windows software will occur.

Cons: No firewall support, additional MCU necessary.

FVC conference server

Product Information
The FVC conference server is a videoconferencing server based on CU-seeMe technology (www.cuseemeeworld.com). It is a complete software based MCU enabling multicast videoconferencing between a group of people. Only hardware has to be purchased to enable video conferencing.

The video conferencing server features:
- Support of a wide range of end-points and servers
- Various applications enabling high-end corporate video conferencing, application sharing, web-based video and data collaboration
- Flexible customization to fit network topology: network topology can be viewed and altered in a graphical way, enabling easy overview.
- Works through H.323 firewalls
- Simultaneous fluid access to low and high bandwidth users without compromising any user's videoconferencing performance
- User-friendly interface enabling participants to set-up conferences at any time from anywhere via their web browser

Purchasing information
For up to 10 users, the FVC conference server costs $11,900. It can be purchased through the website of FVC, by sending an email to the sales department at salesinfo@fvc.com. To enable usage behind various firewalls, the application Click To Meet Express has to be purchased as well, at a cost of $16,900. Total price of hardware and software is $21,900, offered at a special price.

Final Judgement

Pros: All possible services needed in online collaboration are offered by the product. Furthermore multipart video conferencing is possible in which firewalls do not give problems. An additional advantage is that web endpoint software is included in the price. Users (up to the max. number) can download the endpoint software from the fvc server website once appropriate audio and video equipment is installed on one's computer.

Cons: Still a pretty expensive product.

Mediabuilder

Product information
Mediabuilder is a tool developed by Lucent technology, Bell lab innovations. It is a multi-party multimedia service creation and deployment platform and enables real-time audio, video and data communication between end-user PC's. In the past, Mediabuilder has been used in the Giga Comed project carried out in the AZR hospital in Rotterdam. Possible application of mediabuilder are in multimedia videoconferences, Tele-learning settings and medical teleconsultation. As such, mediabuilder is well suited for application in the setting defined in the DC-COPS project.

Important features of mediabuilder are:
- Scalable server architecture for load balancing
- Multi cast sessions are possible without external MCU's.
- Supports any windows compatible audio cards and video cards
- Remote camera control for cameras that support VISCA standard
- Chat, file transfer and sharing of MS windows applications.
- Whiteboard based on Mediabuilder's Shared Object collection

Advantages of Mediabuilder over MS Netmeeting are: more people can participate in Videoconferencing meetings; higher quality video at higher bandwidths can be used; higher quality Shared Applications; Control of how much bandwidth clients are using; supports more media like mediaplayer, camera control and session indicator; lower computer load enabling more participants without risk of overload.

Purchasing information
Mediabuilder is not commercially available. However a license can be bought for non-commercial applications, such as the case in the Delft Cluster project. The exact price is being determined by Lucent, but approximately $1,000 per client is a good price indication, for up to 10 users. Depending on the network and number of people participating, a videoconferencing server has to be created. Exact pricing information and terms of delivery will be available shortly.

Final Judgement
Even though Mediabuilder is a very good tool, offering all possible services necessary in online collaboration, firewalls will be a problem. When multiple people are working behind firewalls, Mediabuilder can not be used. Therefore, Mediabuilder is not applicable for application in DC-CoPs.

6.3 Video Conferencing test session

Motivation
From all products compared in the previous chapter, there are only a number that offer multipart video conferencing while also enable handling firewalls. These products differ significantly in price, ranging from approximately $20,000 to $100,000. The ability to handle firewalls and to enable multipart video conferencing are essential to application in DC-CoPs.

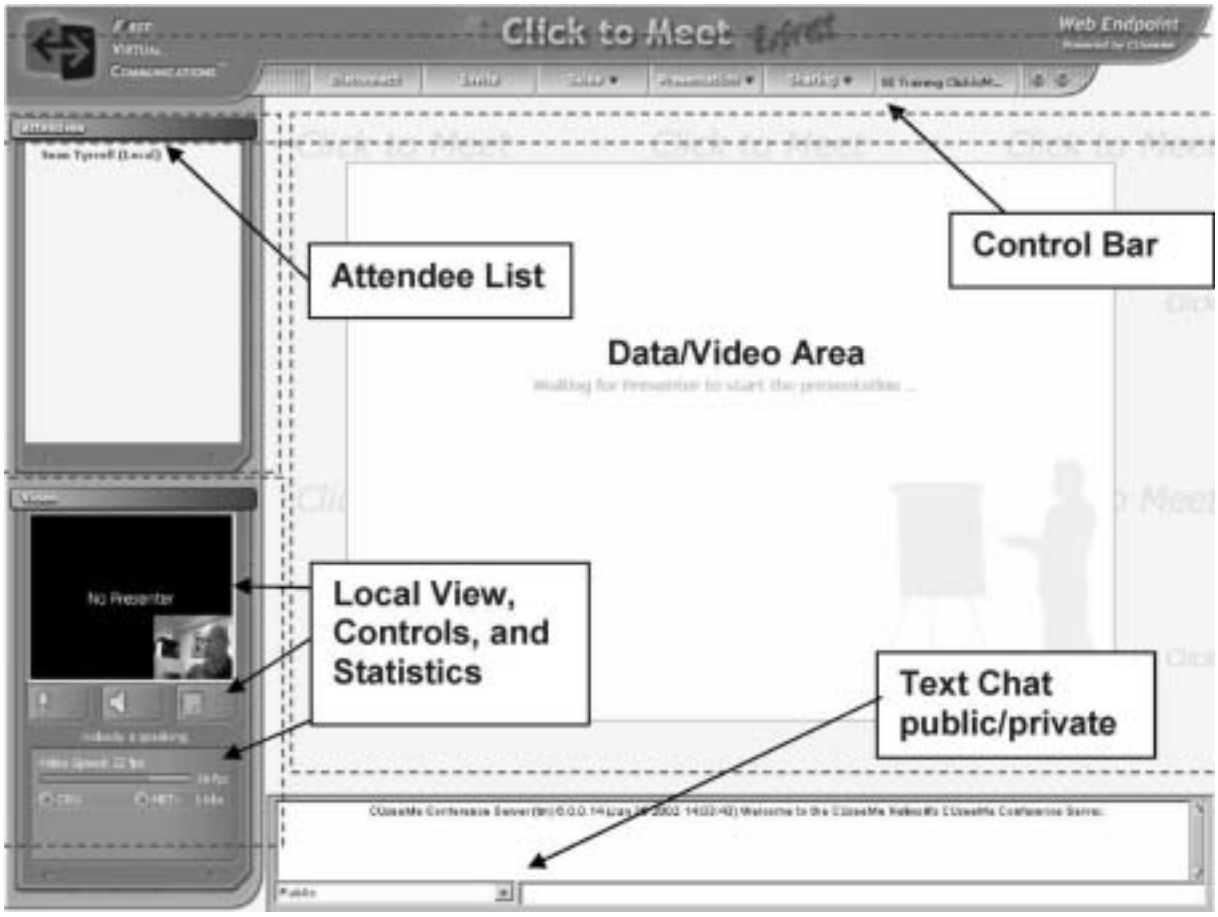
The FVC conference server is the least expensive complete solution offering all essential conditions for use. Frequent contact with representatives of FVC in which support was given and in our opinion the best value for money were the most important considerations upon which FVC conference server was chosen to be the product to be used in practical tests.

Therefore, the FVC conference server was purchased as well as Click To Meet Express, to enable firewall support. A small group of professionals was approached to take part in testing.

Click to Meet Express functionalities

For the video conferencing test session, the following software was purchased from FVC: FVC Conference Server version V6.03 and Click To Meet Express. In this configuration the Conference server functions as a software MCU, whereas Click to Meet Express provides the users with an easy user interface to initiate conferences and add functionalities. The prerequisites for joining the Video Conferencing session were a Windows XP, 2000 or 98 operating system (no NT4!). Furthermore, the PC's in use as endpoints were to be equipped with a webcam (USB camera, no camera on parallel port) and microphone/headsets. Accessing the video conferencing environment was simple by surfing to http://www.e-conference.nl:8080/ctmexpress/index.htm. Prior to entering the video conferencing environment, software was to be installed to have the PC function as a videoconferencing end point. Installing the software was just as easily done with a few mouse clicks. After installing the configuration it can be tested. The resulting 15 fps video streams were satisfactory, as well as the quality of sound.

Logging in to the Video Conferencing environment was done by entering a unique, 5-digit, number. The main conferencing window looked as shown below:



The main control bar on the top consists of buttons to control the video conferencing application: inviting attendees, choosing the lay-out, and sharing applications. Using the button 'skins', the way the various video windows are arranged could be chosen.

Other options available with Click to Meet Express are giving presentations and application sharing. When taking control, a presentation may be opened or created. Control can be taken over by any participant of the session. Also, application sharing, whiteboard and file transfer can be done.

Evaluation of Video Conferencing session

January 9th 2003 a test was carried out in which in total 5 participants took part. One participant didn't manage to connect to the conference server, probably due to firewall problems. All other participants could connect. Analysis of video material within Click to Meet Express showed frame rates between 10 and 15 fps for all participants. This allowed acceptable live streams to be seen from all participants. Even when multiple participants were talking at the same time, sound was acceptable as well. Some problems relating instability of systems occurred. Some participants were forced to reboot their systems, but the overall performance was acceptable. The next sections describe the individual comments of some of the participants.

Participant 1

Participant one was working on a Windows 2000 platform, equipped with a Logitec quickcam zoom and Labtec axis 502 headsets. This participant was rather positive. Inexperience of the users caused some functionalities not to work at first. He considered good preparation to sessions like this important. A negative issue of the test he considered the instability problems of the individual systems. In his opinion no videoconferences should be held for over 5 participants, because of technology reasons, but also because that would negatively influence effectiveness of meetings. The discussion that was held with three participants in the second part of the session went pretty well. Further and more extensive testing and comparing with other VC applications should really prove the added value.

Participant 2

Participant two was working on a Windows 2000 platform, also equipped with a Logitec quickcam zoom and Labtec axis 502 headsets. Participant two thought it was an interesting medium, with added value compared to for example telephone. However, he considered it not (yet) ready to replace face-to-face meetings. Certain parts of the technology still gave problems, for example firewalls, low resolution, less than optimal sound quality, insufficiently fast pc's, window blue screens etc… Considerable testing with clearly defined purposes will be necessary to achieve acceptable performance.

Participant 3

Participant three was working on a windows XP operating system with a Philips ToUCam PRO webcam and a labtec C-324 headsets. Despite of the already mentioned technology related problems, the third participant was reasonably satisfied with the test. Especially the fact that in total 5 persons were able to communicate with each other behind different firewalls was considered positive. It should be investigated why one participant was not able to enter the conference, however.
Click to Meet Express proved to be an easy to use environment for having video conferences. Even though at first it took some getting used to, especially the later part of the session went well. Performance of tool was pretty slow however. It took some time to start things up, and the tool was not stable all the times. Chatting, application sharing and whiteboard went fine, even though the mechanism of taking control of applications was not as easy as it could have been. The fact that even with 5 participants in the conference frame rates were still around 15 fps shows the potential of the FVC conference server. This participant tends to agree with the others in the thought that more extensive pre-scheduled testing will have to be necessary to get a good impression of what it is really worth.

Concluding remarks

Summarizing the opinion of the participants, it can be concluded that an overall positive opinion existed of the FVC conference server with Click to Meet Express. Some technology related issues have to be sorted out and further testing is necessary. The test does however show that the video conferencing application used does however support video conferences up to 5 participants. When more insight and experience has been gained, it is the thought that collaboration over the internet using the conference server and software will have an added value compared with conventional methods like telephone, email and chat. However, at the moment the participants do not think that video conferencing will be able to replace the necessity for face-to-face meetings.

6.4 The future of video conferencing

The overview of available video conferencing tools is only a fraction of the total offer of video conferencing solutions available. Many efforts have been focused at realizing all different kinds of video conferencing systems like desktop, set top and group systems. All these systems have their advantages and disadvantages, but for the application defined in the DC-Cops project, desktop systems were most applicable. Video conferencing systems will only be used at a large scale once the **people** who are supposed to use the systems **accept** them. This is what development and use of these systems must focus on. Some issues have to be addressed in order to increasing the rate of acceptation of video conferencing systems by their future users:

The benefits of VC have to be outlined in terms of increased efficiency, quality and frequency of meetings, exchange of information and knowledge. Also examples of successful implementation of VC systems could be brought forward.

Since it is a natural tendency of humans to be faithful to current working practice, the use of VC systems has to be promoted. Once employees within a company or project team have desk top VC systems, they should be encouraged to use them. First they have to be trained thoroughly, and then certain rules can be defined. For example, each physical meeting that requires travelling can be preceded by a VC meeting. This way, the people involved can compare physical and VC meeting and may start to recognize the added value of VC meetings. Also, the new ways of collaboration made possible by VC meetings (virtual collaboration by chatting, application sharing and other collaborative applications) may be better recognized. After a period of time, the people involved may realize that the physical meetings cost much more time due to travelling, while the outcome of the meetings can be realized just as well with VC meetings.

In any case, VC systems have to be implemented in such a way that finding and contacting people is just as easy as through conventional communication: picking up the phone and calling someone should not be easier than initiating a VC session with someone. Also the way of collaborating with people in the VC environment should be such that it resembles face-to-face meetings as closely as possible: sharing applications and transferring files should be done by single mouse clicks and imaging and sound quality should be as good as possible. This requires fast (broadband) connection and powerful computers.

It is not realistic to think however that VC meetings will replace physical meetings in the future. The feeling of being in one room with a number of people can not be realized through Video Conferencing. However, once the use of VC systems has been accepted by the users, the frequency of physical meetings may be significantly decreased, which would save considerable time and money.

7 Conclusions

Knowledge Management *Research* Theme was set up to *facilitate* collaboration in Delft Cluster. Unlike disciplines contained in the other six Research Themes, knowledge management was not the core competence of any of the participating organisations. Consequently, no necessary expertise on Knowledge Management was available at the beginning of the Research Programme. However, as KM models and instruments cannot be applied according to a blueprint, some research on specific needs and requirements of Delft Cluster was required anyhow. Gaining the expertise on knowledge management and studying the specifics of Delft Cluster took some time, so that crucial momentum in applying KM instruments and services at the very beginning of the Research Programme was lost. This holds especially for the Project Teams who had to be informed about the role of knowledge management on time (during the kick-off meetings) and to be supported by a set of KM services from that moment onwards.

Quite some DC researchers seemed to appreciate Delft Cluster as another government co-funded project. The ambition of Delft Cluster to establish a long-term collaboration was sufficiently communicated to them, but the role the researchers were supposed to play to achieve this ambition was certainly not. DC researchers are supposed to share their knowledge in order to create and subsequently disseminate new knowledge. This process is however, very delicate, especially in situations where one DC partner may want to claim expertise over a certain technology or problem area. The question remains whether at the start of such an ambitious endeavor a rather loose cross-organisational setup can ensure a sufficient commitment to a substantial knowledge sharing among organisations that for some of the time are also in competition.

The character of the Delft Cluster organisation also played an important role in the realisation of a DC technological (knowledge) platform. DC partners use various, not necessarily compatible, software and hardware. Consequently, the selection of a DC technology also had to serve important corporate company interests. Yet, some progress towards implementation of a common (or at least compatible) technology has been made.

The first Delft Cluster technological platform (DC Intranet) was launched after a few months, but without a proper announcement. Besides, *roles and responsibilities* of DC Back Office, KM Theme and project leaders regarding the content of the Intranet were not clearly defined. Consequently, for the long time the content was infrequently updated and the site rarely used.

In the course of the Research Programme realisation, a package of KM services has been developed to support collaborative working in DC Communities of Practice and related Project Teams. The package contains both People Network Services and Technology Framework Services, to be provided on-site and on-line. Some of the services have already been implemented, such as a (digital) Collaborative Working Environment, where more than a hundred Project Teams have their collaborative workspaces. Unlike the DC Intranet, the Collaborative Working Environment was announced properly, introductory workshops were held and on-line support has been provided. Yet, a wider use of Environment could have been achieved were it not for a number of reasons (see below).

Most of the DC researches had *no experience* in working in a digital environment, so they had to be *motivated* to learn to use it. As DC researchers were not *obliged* to use the Environment, therefore they had to be motivated by clear specification of a possible contribution (added value) of the Environment to the project execution. However, many DC projects were split into tasks to be accomplished (as much as possible) by individual team members, minimising the need for intensive collaboration. Besides, some teams were small (3-4 members), and some had a majority of team members coming from the same DC partner organisation. In those teams the need for collaboration in a digital environment was not particularly strong, so that team members decided to collaborate as they usually do in external projects (e-mail, phone and occasional face-to-face meetings).

In separate series of workshops, a comprehensive KnowMe questionnaire was developed in order to measure the state (and the progress) of knowledge management in Delft Cluster. The measurement has been shown to be helpful in specifying the needs of Delft Cluster researchers. For instance, the DC Intranet and Collaborative Environment would have been more frequently used if they provided information on *side issues* (project management and evaluation, publishing procedure, intellectual property rights, etc). Obviously some KM services should be integrated into a corporate function, provided by a Back Office. The issue of a Back Office points to the *organisational aspect* of knowledge management; this third - next to technological and social - knowledge management aspect has not received enough attention in the Delft Cluster virtual organisation.

Within a company, *organisational structure* is used to foster the realisation of knowledge management activities. Line management in the company has more authority than the management of a cross-organisation *virtual* knowledge centre. Additionally, knowledge management at the company level is carried out with backing of various organisational units (i.e. Personal Dept, Financial Dept, Project Office, Communication & Documentation Dept.). The Delft Cluster Back Office was originally very understaffed, consisting of scientific director, financial deputy, secretary and PR officer. As such, the Back Office could not meet all the needs of DC researchers.

Not only needs and requirements of researchers are in question, but also those of the Delft Cluster Knowledge Centre. Therefore a mechanism should be introduced (institutionalised) to *secure participation* of researchers in knowledge management activities. Although knowledge sharing can be only voluntary (and not conscripted), agreements can be made (including penalties and bonuses) on processes that support or enable knowledge sharing. If a substantial part of knowledge is generated in Project Teams, some knowledge management activities need to be incorporated into a project management procedure. For instance, filling in and updating a Project Knowledge Card or extracting Lessons Learned (both required for the DC knowledge repository) should become a compulsory part of project management procedure.

Cooperation with the GWW sector established during this project could be considered as satisfactory. This holds especially for the NetCoast and NWP project partners because the products and services provided by the CoPs Team are still in use by these organisations. This is a tribute not only to the CoPs Team but also to their partners, who are committed to active usage of the developed tools and related services. In the case of the Netherlands Hydrological Platform (NHP) the motivation to use a newly-developed platform was minimal. This confirms once more the importance of the organisational aspect of Knowledge Management.

In the Netherlands, large (Delft Cluster like) cross-organisational projects are initiated and co-financed by government on regular basis. These projects yield, in general, satisfactory results, but often do not leave behind enough leverage for continuation of an intensive collaboration after the project completion. The question is how could knowledge management most efficiently support on-going and future collaboration? An inquiry conducted by DC KM Theme showed involvement of DC researchers in over a hundred various CoPs, some of them originating from previous cross-organisational projects. Any attempts to formalise these *old boy networks* failed. Therefore, what Knowledge Management can do in a cross-organisational research setup is to promote knowledge sharing during the project execution, to develop a common digital knowledge repository and collaborative environment, and to provide an efficient dissemination network. In the last three years the DC CoPs Team tried hard to contribute to these goals.

8 References

Boekhoff, T.,
Managing the Knowledge Factor,
Twynstra Amersfoort, 1998.

Boyd, A.,
Shell EP's Global Networks B Knowledge Sharing,
in *The real value of Virtual Communities*, CIBIT Knowledge Centrum, The Netherlands, 2001.

Cap Gemini,
Knowledge Management; The Cap Gemini Way,
Cap Gemini, Utrecht, 1999.

Castells, M.,
The Rise of the Network Society,
p556, Blackwell Publishers Oxford UK, 1996.

CoP Team,
DC Communities of Practice Project – Interim report I, (DC Intranet), 2000.

CoP Team
DC Communities of Practice Project – Interim report II, (DC Intranet), 2002.

Collison, C.,
BP Amoco's Knowledge repository: Connecting the New Organization,
in *Knowledge Management Review*, Issue 7, 1999.

Coviello et al.,
Standardised KM Implementation Approach,
European Knowledge Management Forum,
(http://www.knowledgeboard.com/library/deliverables/ekmf_d31_v08_2002_02_26_cezanne.pdf),
2002.

Davenport, T. H. L. Prusak,
Working Knowledge,
p199, Harvard Business School Press, USA, 1998.

Heijst van, G. E. Kruizinga,
Kennisinfrastructuur; de Ruggengraat van Lerende Organisatie,
CIBIT Kenniscentrum, Utrecht, 1997.

Kelleher, M.,
KALIF; To Share is to Multiply,
CIBIT Kenniscentrum, Utrecht, 2001.

Kooistra, L.,
Virtuele Teams; Werken via het World Wide Web,
Eindwerkstuk Programma Knowledge Management TIAS Helmond, 1999.

Kukuric, N. and R.K. Price,
Cross-Organisational Knowledge Sharing: Introducing Delft Cluster
WAITRO Conf. On Knowledge Management in Research and Technology Organisations,, Hague, The Netherlands, 2001.

Kukuric, N. and S. Velickov,
Cross-Organisational Knowledge Management: a Case Study,
I-KNOW -02, Int. Conference on Knowledge Management, Graz Austria, 2002.

Lai, H. and T-H.Chu,
Knowledge Management: A Review of Theoretical Frameworks and Industrial Cases,
33rd Hawaii int. Conf. On System Sciences, Hawaii USA, 2002.

McDermott, R.,
Learning Across Teams: The Role of Communities of Practice in Team Organisations,
Knowledge Management Review, May-June 1999, 1999a.

McDermott, R.,
Nurturing Three Dimensional Communities of Practice,
Knowledge Management Review, Fall 1999, 1999b.

McDermott, R.,
Knowing in Community: 10 Critical Success Factors in Building Communities of practice,
IHRIM Journal March 2000, 2000a.

McDermott, R.,
Community Development as a Natural Step,
Knowledge Management Review December 2000, 2000b.

Lipnack, J.,
Virtual Teams; Reaching Across Space, Time, and Organizations with Technology,
p262. New York Wiley, 1997.

Nonaka, I. and H. Takeuchi,
The Knowledge-Creating Company,
p284, Oxford University Press UK, 1995.

Rheingold, H.,
The virtual Community; Homesteading on the Electronic Frontier,
p325, Reading Addison-Wesley, 1993.

Soekijad, M. et all,
Knowledge Sharing in delft Cluster Communities of Practice
Delft Cluster report, (DC Intranet), 2002

Spek, van der R. and A. Spijkervat,
Kennismanagement; Intelligent omgaan met Kennis,
CIBIT Kenniscentrum, Utrecht, 1996.

Tiwana, A.,
The Knowledge Management Toolkit,
p608 and a CD-ROM, Prentice Hall NJ USA, 2002.

Verwijs, C et al.,
Kennismaken met Kennismanagement,
Telematica Instituut Enschede, 1999.

Wenger, E.,
Communities of Practice: Learning, Meaning and Identity,
p318, Cambridge University Press, UK, 1998.

Appendix 1 Quick Scan Analysis

Introduction

Quick Scan was prepared as a part of monitoring procedure for Delft Cluster Collaborative Environment. The purpose of the Scan was to provide input data for evaluation of Environment. Quick Scan was conducted in November 2001.

Some information useful for Environment evaluation could be obtained from a tracking/notification system available in the Environment platform. Besides, since the Environment was launched in April 2001, many DC researches expressed their opinion about the Environment, usually during the workshops and various DC meetings. Yet, the collected information was not considered sufficient for an objective evaluation. Therefore the Quick Scan was prepared in order to approach a large group of DC researchers and obtain a substantial response on a number of questions relevant for the evaluation.

While preparing the Quick Scan two issues received special attention: a mailing list and the questionnaire design. The simplest way to prepare the mailing list for the Quick Scan would have been to use a membership list from the Environment. However, the Quick Scan was also meant for DC researchers who do not use the Environment of who have even not heard of it. Information on DC Collaborative Environment was sent in April 2001 by e-mail to all DC project leaders. The Quick Scan is sent to the project leaders to check why some of them (in fact the majority) decided not to use it. Updated project leader list as obtained from DC bureau (92 DC researches) was extended by a list used for invitations to DC Lunch Seminars. Eventually, the Quick Scan mailing list contained in total 114 names. The members of CoPs team and CoPs external partners were excluded from the list.

Electronic questionnaire was the only form of Quick Scan considered during the design, because filling in a paper form and sending it back would be much more time consuming for respondents. The most convenient way to send Quick Scan was to include it in the e-mail, so that respondent can answer immediately (see the figure below). In the e-mail, the Scan was shortly introduced, including the link with the Collaborative Environment.

The Scan should not have been too lengthy and should not have asked for extensive answering in writing. Eventually eleven questions were chosen, ten of them (exception was the respondent name and projects) to be answered affirmatively or negatively (Yes or No), or by using provided multiple choice answer. A possibility for an elaborated response is provided for a several questions, together with a space where general remarks and recommendations could be placed (closing, twelfth segment of the Scan). The Quick Scan is shown in the appendix of this document.

The analysis of Quick Scan response is given per question/segment below. Some general remarks and conclusions are summarised in the closing part of the report.

Quick Scan Analysis

Total 37 reactions have been received, three of them being an automatic server reply ”user unknown”. Apparently the mailing list was not completely updated. Statistically 31% (34 of 111) of approached DC researchers responded on Quick Scan. Six responses were sent via e-mail “Reply” rather then via “Submit” of Quick Scan. One DC researcher could have not seen Quick Scan in the e-mail; no other technical problems were reported.

Question 1: Your name

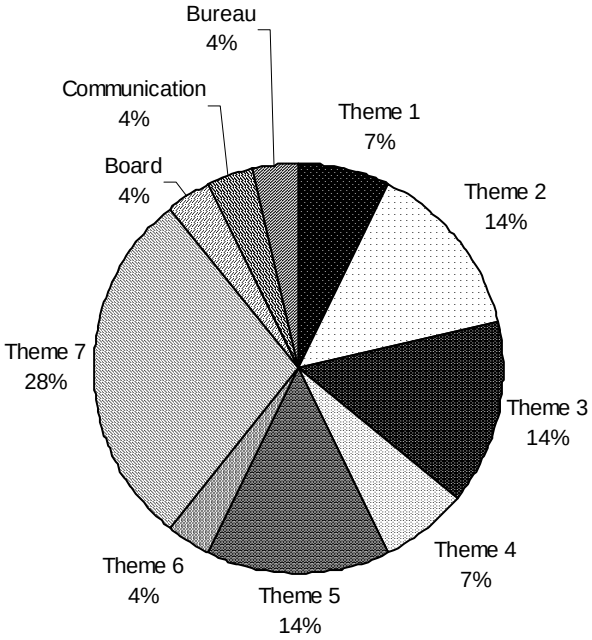
All the respondents have filled in their names. An option to send anonymous response was actually not available since responses were sent by e-mail.

Question 2: Your Delft Cluster project(s)

Most of respondents specified only one project, or more projects but from the same Theme. Only two respondents specified involvement in (two) projects of different Themes. There were also respondents from DC Board, DC bureau and DC Communication group (see the chart).

The largest response was, as expected, from Theme 7 (28%). Themes 2, 3 and 5 responded equally (14%). This outcome is very much in correlation with the use of DC Collaborative Environment.

Contribution (a share in response) of Theme 7 and Theme 6 would have been substantially larger if CoPs external partners (Netherlands Water Partnership, NetCoast and Netherlands Hydrological Platform) were involved in the survey.



Respondent involvement in Delft Cluster

Question 3: Are you informed about existence of DC Collaborative Environment?

Options: Yes/No (if "No" please give a remark)

Among 33 respondents 25 (76%) responded affirmatively and 8 (24%) negatively. Four (of eight) uninformed respondents provided a remark:

Respondent remark: "*I know nothing of the aims of this tool. Send me some info so (that) I can determine its value for me*."

Reviewer comment: Quick Scan was sent to respondent because his name appears at the DC Lunch Seminar mailing list. The respondent is not a project leader - so no prior information on DC Collaborative Environment was sent to him. Hence, he could be informed only by his project leader of via DC Internet site.

The respondent is active in Theme 4 where LiveLink is promoted and used (in one of the major projects). LiveLink is also used at GeoDelft which is the leading partner in Theme 1. Therefore the CoPs team put more effort in promoting DC Collaborative Environment in Themes other than Theme 1 and 4.

Respondent remark: "*I use the Delft Cluster Intranet, but that might be something different. The site mentioned is fully unknown to me*."

Reviewer comment: the same as given for the respondent above. Additionally: in order to avoid mixing up DC Intranet and DC Collaborative Environment a link to DC Collaborative Environment was placed next to its name in the Quick Scan introduction (see above).

Respondent remark: ”*It is time consuming to learn more about it. What could I gain from it?*”

Reviewer comment: Benefits of use of DC Collaborative Environment are briefly described in its Home Page (the www address included in the Quick Scan Introduction), and also specified in the e-mail sent to all DC project leaders. Later on, the benefits were presented during the CoPs Lunch Seminar and described in the CoPs Leaflet.

Respondent remark: "*I do not use this service and do not know why or when I should.*”

Reviewer comment: The respondent is registered in DC Collaborative Environment and hence informed.

None of four uninformed respondents who did not provide remark is a project leader. One of them is a member of the DC workgroup Communication.

Question 4: Are you registered as a member in the Environment

Options: Yes/No (if “No” please state why)

Among respondents informed about existence of DC Collaborative Environment 4 respondents are not registered in the Environment. Here are their explanations:

Respondent explanation: “*The collaborative environment is not yet in use for discussions on the board level of delft cluster*.”

Reviewer comment: True. A place was made (at the highest level of the Environment structure) for DC Management but not for the DC Board. Since the CoPs team experienced lack of enthusiasm among Theme leaders and DC Management regarding the use of the Environment, the team did not expect to find some at the highest DC (Board) level. Consequently, the DC Board was never approached by the CoPs team.

Respondent explanation (from Theme 4): ”*As you know we use LiveLink*.”

Respondent explanation (from Theme 4): ”As you know we use LiveLink and DC Intranet, or better to say, we hardly use both of them. It would be good to sit together and compare our and your experience.”

Reviewer comment: Both respondents from Theme 4 are involved in the KSH project. Further contacts have indeed been made in order to compare and exchange experience.

Respondent explanation: ”*No, so far I haven’t used it because I’m not involved in any of DC projects*”.

Reviewer comment: This remark came from a consultant from GWW-sector.

Question 5: Do you use Environment?

Options: Yes/No (if "No” please state why)

Only two registered respondents did not supply an affirmative response to this question. Their explanation is given below:

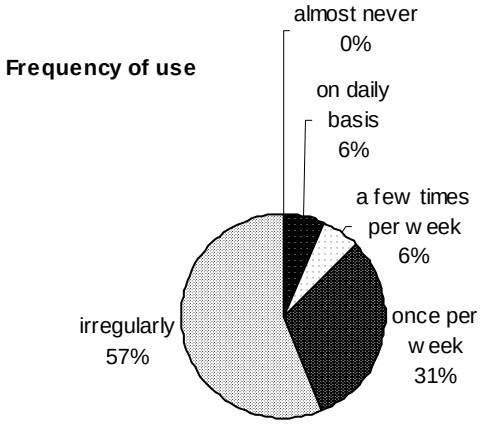
Respondent explanation: ”*I have not started to use it yet but I’m planning on checking it out and using it shortly*”.

Respondent explanation: ”*I use LiveLink at GeoDelft and I find BSCW not very handy*.”

Reviewer comment: In some aspects is LiveLink more "handy” than BSCW (although a new BSCW version brings substantial improvements).LiveLink is also about 30 times more expensive than BSCW.

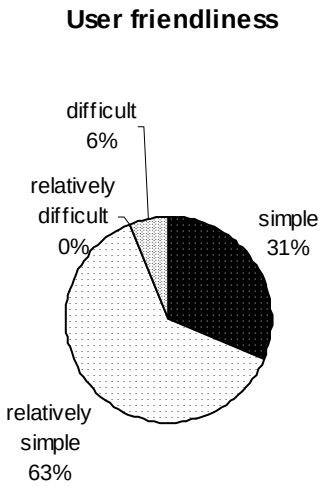
Question 6: You use the Environment: (options: on daily basis, a few times per week, once per week, irregularly or almost never)

Most of the respondents (57%) use the Environment on irregular basis. None of respondents chose the option “Almost never” (see the chart).



Question 7: Use of Environment is: (options: simple, relatively simple, relatively difficult or difficult)

The vast majority of respondents find the use of Environment either relatively simple (63%) or simple (31%). Only one respondent finds it difficult. His/her remark, placed in the last segment of the Quick Scan (12. Remarks/recommendations), is given below:



Respondent remark: ”*I see the operating of (navigating through) the Environment as a major obstacle: the standard layout is poor. I would prefer to have a "Window Explorer"-like environment which could be used more intuitively*.”

Reviewer comment: True. The structure of Window Explorer is more convenient than one of BSCW. Yet, BSCW has an additional browser (BSCW Java Browser) which can be used for the most of operations in the Environment. This browser is very similar to Windows Explorer. Curiously enough, people familiar with this additional browser do not use it. Probably because some operations are available only in the standard BSCW browser (such as Meeting and Discussion Forum); or maybe the most of users do not find standard BSCW browser so difficult to handle. Nevertheless, a new (already released) BSCW version has a much better standard layout.

Question 8: Have you participated in the workshop on use of the environment?

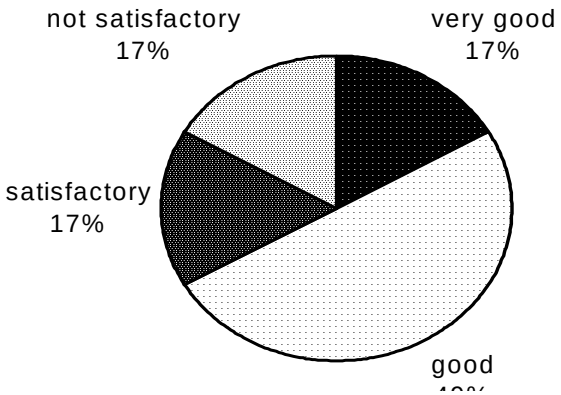
Options: Yes/No (if ”No” please state why)

15 respondents have answered this question; 10 of them (66%) participated in the workshop and 5 (33%) not. No explanations or remarks have been made available on reasons for non-participation.

Question 9: The workshop was: (options: very good, good, satisfactory, not satisfactory).

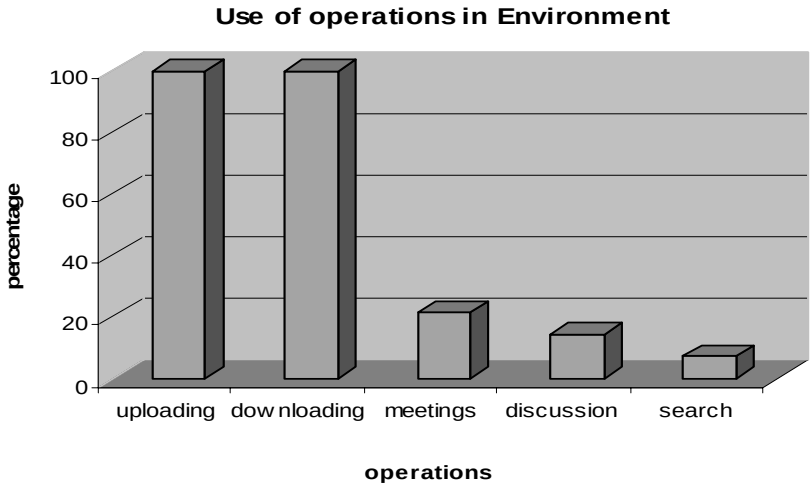
The responses are presented in the chart right.

A (kind) request for elaboration is sent to two respondents who were not satisfied with the workshop.



Question 10: Among the operations available in the Environment you use (options: uploading, reading/downloading, meeting, discussion forum and/or search)

According to responses obtained (see the chart below) the Environment is used almost exclusively as a digital archive (up- and downloading options). "Meeting" operation is meant for both organising face-to-face meetings and as an interface with a tool for net- (virtual-) meetings. Reviewer response: Meeting operation would be more attractive to use if connected with a common agenda (done in new BSCW version!).



Reviewer response: Discussion forum is seldom used because people are used to e-mail. For the communication within the project team is Discussion option in BSCW more useful than e-mail, acting as a centralised communication archive. Its use, however, requires some discipline.

Question 11: Do you prefer to have your workspace in the Environment:

- initially accessible to all Delft Cluster researches (and to have access to their workspaces)
- initially not accessible but with a possibility to grant access to some or to all DC researchers

In total 15 respondents answered this question, 8 affirmatively and 7 negatively. The question was posed as a result of discussion whether each project workspace in the Environment should initially be open to all DC researchers or not. [In the current Environment setup is the access to individual project workspace initially granted only to members of the project team. A project leader is authorised to grant access to anyone else (no limitations).] Some participants in discussion claimed that complete openness of Environment would increase co-operation. On the other hand, not everyone liked the idea of exposing concept documents and internal project discussions to everyone in Delft Cluster. The outcome of the Quick Scan has not contributed to selection of one or the other option.

Segment 12: General remarks and recommendations

Some remarks of respondents have already been mentioned in this document (those of uninformed-Question 3 and one on use of environment - Question 7); the remaining remarks are given below:

Respondent remark: "*I've replied from PKS perspective. The Theme 7 use is much less. We haven't made a decision as a Theme to work together, much less on-line. However, I feel I could quickly operate in a CoPs if one were to spring up on BSCW. Biggest obstacle is having a group of people who are engaged in a common task that unites them in going to the platform at a comparable rate.*"

Respondent remark: "*I would like to see where I am in the environment when I look at a page. Sometimes I get lost. For logging in I would not object to a cookie that remembers my identity instead of having to type name and password each time.*"

Reviewer comment: There is a directory path from one's home directory to the current one, located in the upper part of the window screen in BSCW. Remembering a login name and password is possible in Microsoft Internet Explorer.

Respondent remark: "*System is very slow.*"

Respondent remarks "*Slow response of system kills. E-mail of changes on site is missing. Low activity for creating successful environment due to bilateral meetings and e-mail and lack of stimulating project leader, moderator and champions.*"

Reviewer comment: The system was slower in the first months of BSCW use (first half of 2001). Since then, BSCW operates on a high-performance server. No complains about performance have been obtained since (beside these two remark in Quick Scan). The software setup and hardware infrastructure on client side might be a cause of the problem as well.

Respondent remark: "*I would like to set an alert on a document in order to get an E-mail when the document has been accessed or changed. I would like drag and drop to become available in the same way as provided by any Windows-based operating system.*"

Reviewer comment: Notification by e-mail in BSCW is available for locked documents. In order to check other changes, the user has to login. The process of checking itself in BSCW is very simple and convenient. Notification by e-mail related to changes at preselected places in Environment would indeed be more convenient, and it is available in a new BSCW version! Drag–and-drop option is already available in BSCW.

Respondent remark: "*The archive is very good, no more attachments in e-mails are needed. The workshop has not yet been used in this project. It probably will not be used, since no multi-lateral contact was necessary except for the real meetings. Bilateral contact is easier via the telephone.*"

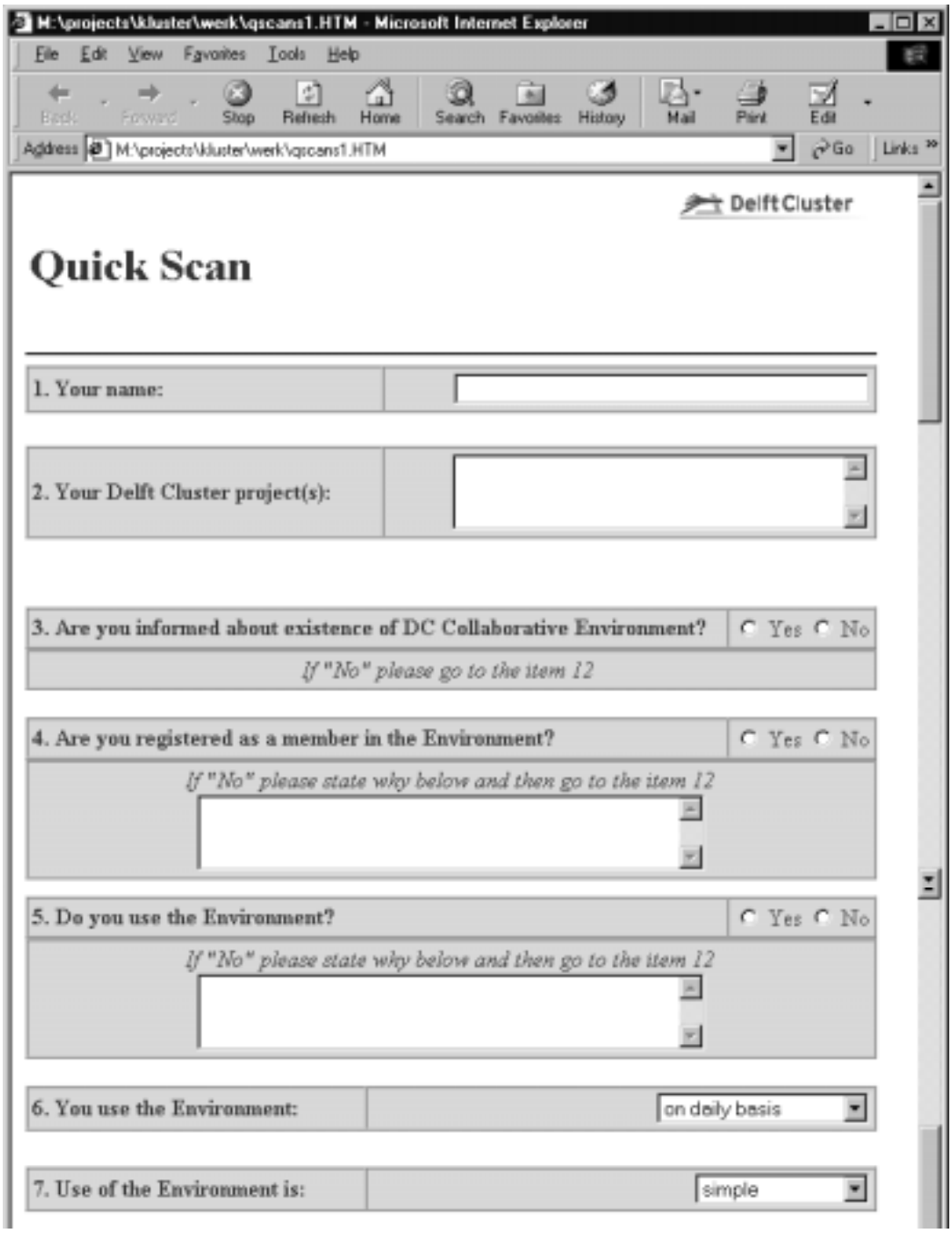
Concluding remarks

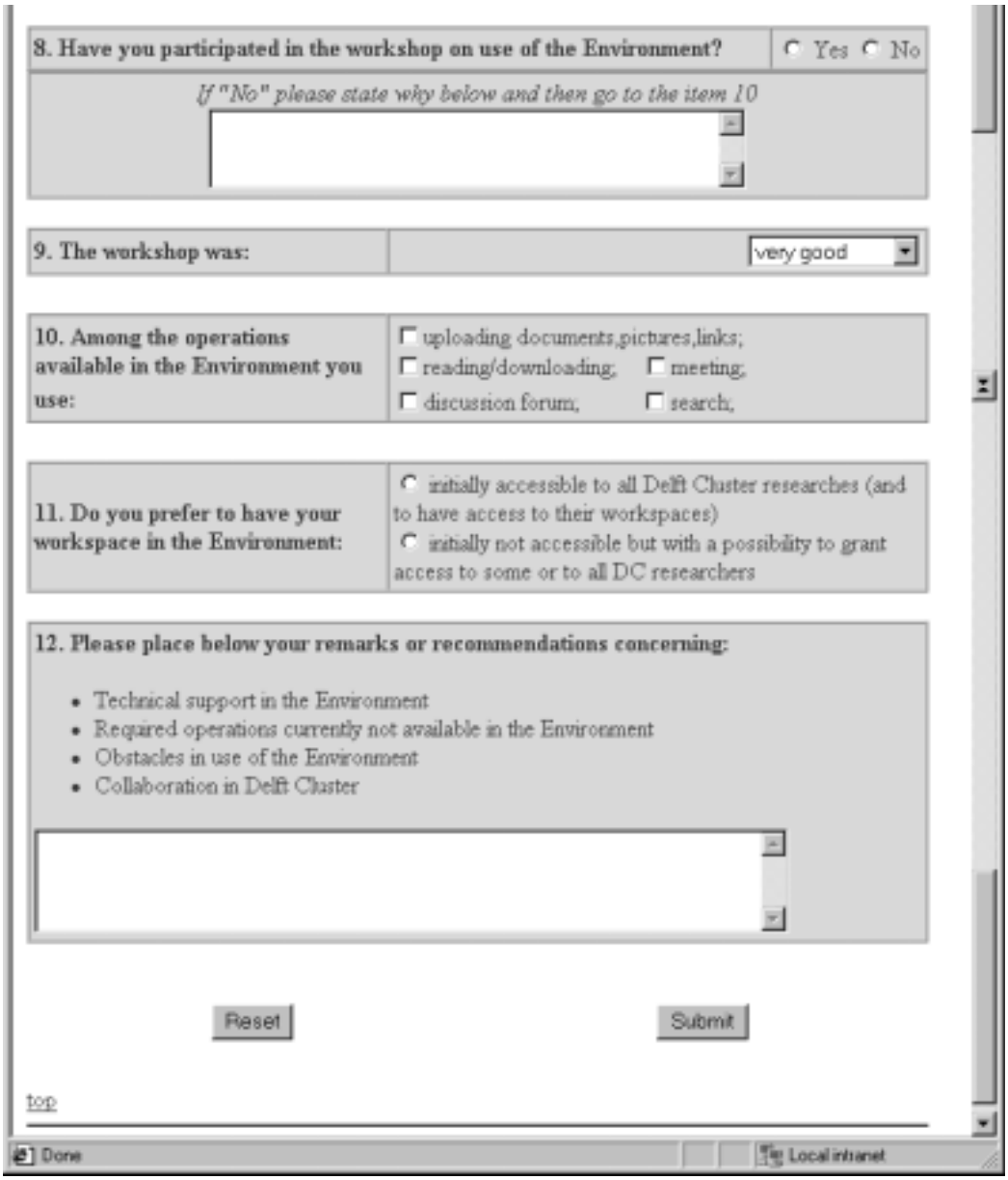
Response on Quick Scan was satisfactory. Quick Scan should have been sent to all DC researchers.

There were no major technical problems. Confirmation of “Submit” operation in Quick Scan should have been included.

A substantial part of respondents is unfamiliar with DC Collaborative Environment. An e-mail containing information on Environment should have been sent (in April 2001) not only to DC project leaders but also to all DC researchers. In several occasions during the last year DC researchers (not being project leaders) approached the CoPs team with a request for the registration.

DC collaborative Environment is primarily used as a digital archive on irregular basis. Some users of Environment are not familiar with all operations available in the Environment. Comments of respondents related to functioning of Environment could have been sent during the last year to the help-desk.




8. Have you participated in the workshop on use of the Environment?
Yes
No
If "No" please state why below and then go to the item 10
9. The workshop was:
very good
10. Among the operations available in the Environment you use:
uploading documents,pictures,links;
reading/downloading;
meeting;
discussion forum;
search;
11. Do you prefer to have your workspace in the Environment:
initially accessible to all Delft Cluster researches (and to have access to their workspaces)
initially not accessible but with a possibility to grant access to some or to all DC researchers
12. Please place below your remarks or recommendations concerning:
Technical support in the Environment
Required operations currently not available in the Environment
Obstacles in use of the Environment
Collaboration in Delft Cluster
Reset
Submit
top
Done
Local intranet

Appendix 2 Analysis of involvement of DC researchers in CoPs

- based on KnowMe inquiry -

In the framework of KnowMe inquiry some data are collected over "DC Communities of Practice" or rather over involvement of DC researchers in Communities of Practice. This limited, but still very useful data set is used to analyse state of the matter concerning both DC CoPs and the CoPs-project activities.

A brief analysis of KnowMe data

In total 36 (from 49) project leaders acknowledged their participation in 105 communities. Some communities are mentioned by a few project leaders (see the table below):

Community	counted (times)
AIO-network	4
TAW	4
HABIFORUM	3
NCK	4
GTI	2
CROW	3
CUR	4
NARIP	2
DC	3

meaning that in total about 85 communities were indicated in the KnowMe questionary (interesting: some respondents see DC as a CoP).

Respondents were asked to indicate:

- relation to the DC in general and to a particular DC Theme;
- a number of participants in the community,
- national or international character of the Community.

About 70% of respondents filled in the corresponding rubrics in the questionary. A majority of CoPs has some relation with DC. Usually no indication was made to which Theme, however it can be assumed that respondents -when answering 'yes'- were referring to their own theme.

A number of participants indicated per community varied from 5 to 4000. Approximately dozen communities have international character; some of them are international bodies such as "The Joint Committee on Structural Safety" and others so-called mailing lists such as Environmental Forensics mailing list.

In general, respondents were not precise in describing communities, using either general terms ("policy analysis", "ecology", etc.) or acronyms ("DOSO", "CKM", etc.). That made recognition of communities difficult, sometimes impossible. Some communities were 'decoded' using web-search tools, however for about 20 of them no info on www could have been found or no precise search could have been conducted (due to too general terms). Idea to make a contact with respondents requesting additional information was abandoned, because it would not substantially contribute to the content and representativeness of the sample used in this analysis. Although information on CoPs-membership should be made available to DC fellow researchers, that ought to be done through the

process of knowledge mapping; DC researchers are supposed to fill in data on CoPs-membership in their Knowledge Cards.

Some conclusions could be derived from the KnowMe measurement, indeed cautiously; the sample might be biased because it includes only DC project leaders (which as prominent researchers could have more contacts and memberships than an average DC researcher). About 70% of respondents acknowledged their membership in one or the other form of organised collaboration. It might be expected that some interviewees did not respond being unfamiliar with the term CoPs and wondering whether their involvement in some collaboration forms fits in a CoP-definition given in the KnowMe questionary. Others were apparently less hesitant, specifying all kinds of links they have within or outside their organisations. Nevertheless, these various collaboration forms and links need to be discussed with respect to Delft Cluster Communities of Practice, their emergence and facilitation.

Lessons Learned for DC Communities of Practice

CoPs recorded by KnowMe inquiry are CoPs of DC researchers but not necessary DC CoPs! For the purpose of clarity it should be stated that DC CoPs are only those Communities set up and facilitated by Delft Cluster. The primary purpose of DC CoPs is to assist sharing and dissemination of knowledge among DC researchers and with their external partners. Other (non-DC) Communities could also contribute to the same goals, especially those wherein researchers from various DC member organisations are involved (e.g. The Netherlands Centre for Coastal Research). However, these CoPs are neither founded nor facilitated by Delft Cluster. Their importance, regarding DC knowledge management, is therefore primarily in providing:

- lessons learned for setting up and facilitating DC CoPs, and
- information on interesting CoPs for DC researchers (via Knowledge Cards - see above).

Communities recorded by KnowMe inquiry could be divided in three groups

- communities set up outside DC;
- communities set up within a DC member organisation;
- communities set up within DC (including more than one DC member organisation).

Within each group two basic types of Communities could be distinguished: open and closed. Open Communities are in principle less formal, the participation in a Community is based solely on interest in a particular topic and there are no specific membership restrictions. Closed communities are usually set up by some authority and members are appointed, having some formal tasks.

<u>Communities set up outside DC</u>

World Wide Web contains a countless number of Communities organised around various topics. These are mostly open-type communities and some of them are mentioned in KnowMe inquiry (e.g. Knowledge Management, Organic Chemistry, Communities of practice - http://groups.yahoo.com/group/com-prac).

A good example of closed-type “external” Community where a several DC researchers are involved is TAW (Technische Adviescommissie voor de Waterkeringen, http://www.waterland.net/taw/) founded by Ministry for Transport, Public Works and Water Management. TAW-like Communities are rather formal bodies (committees or commissions) than Communities of Practice. Yet, they are mentioned because they have some characteristics of CoPs and they might require and/or use the same or similar methods and tools as CoPs do. Besides, DC might in future consider initiation of similar collaboration forms, next to Project Teams and Communities of Practice.

Several DC researches mentioned organisations like CROW http://www.crow.nl/ and CUR http://www.bouwweb.nl/cur/ as Communities of practice. These organisations participate (usually co-finance) cross-organisational projects which often involve DC member organisations. It is however not known whether some kind of organised collaboration remains among project members after the project termination.

It would be interesting to compare Delft Cluster with two other ICES programs, namely SKB (http://www.skb.nl) and HABIFORUM. Although no information could be found on current SKB CoPs, SKB is preparing "Forums", open discussion groups on various soil-related topics (http://www.bodembreed.nl/)

HABIFORUM (http://www.habiforum.nl/index2.html) adopted the concept of CoPs right from beginning, organising CoPs around defined research themes and concrete cases from practice. According to HABIFORUM newsletter, a meta-CoP 'Learning processes" is set up (this year) to oversee all the HABIFORUM CoPs. This new CoP is designed and implemented in co-operation with University Nyenrode and two consultancies. No additional information on CoPs is available on HABIFORUM site. (Attempts made to initiate co-operation with HABIFORUM over CoPs have failed so far)

Communities set up within a DC member organisation

Several of these intra-organisational Communities were reported in the KnowMe inquiry, most of them by GeoDelft researchers (GD-young, geohydrology group, market group, etc.). In some cases they are in fact good old-fashioned experts groups (hence, Communities in real sense of the term), in other cases they are set up by management to improve some particular segments of the company's business.

A recent inquiry conducted at TNO-NITG pointed out appreciation for expert groups which would gather specialists from different organisational units. These groups are however very informal and the success of their formalisation is questionable. Nevertheless, an attempt should be made to map these communities, taking in account that:

- the benefits of mapping for Community members are carefully formulated and conveyed
- assistance in facilitation of Communities is offered.

If assistance includes ICT, the technology should not only be made available but also properly introduced to Community members. Since recently, some intra-organisational Communities are asked to use ICT to support their activities, but gained experience is not always positive (see also DC 07.03.02 report "Knowledge Sharing in DC Communities of Practice").

The question is weather some of these existing intra-organisational Communities could be mutually connected in cross-organisational DC Communities. No such attempt has been made so far because of a number of well-known obstacles. Project-based cross-organisational collaboration has much more chances to be successful and, moreover, it could create a basis for a long-term, less formal collaboration among former project team members. Very often Communities of Practice are founded by people who once worked together and that gives an additional significance to collaboration in DC project teams. By facilitating project-based collaboration (and promoting its value), Knowledge Management contributes emergence of DC Communities of Practice. That was the main reason for initiation of DC Collaborative Environment in the framework of the CoPs-project.

DC Communities of practice

DC Communities of practice, as defined above, do they exist at present? Three respondents in KnowMe enquiry indicated Delft Cluster as a CoP (or CoPs). Strictly speaking, this response in not in accordance with the definition of CoPs, because the current co-operation in Delft Cluster is organised

around projects. Broadly speaking, however, the respondents are right; they already see Delft Cluster as a Community of Practice, being aware of long-term purpose of Delft Cluster initiative. This way of looking at DC should be nurtured as much as possible.

One of the respondents specified DC project "Sedimentation Model for the Port of Rotterdam" as a Community of Practice. An apart interview was made with this respondent in the framework of DC project 07.03.02, yielding some interesting observations (see the corresponding report).

Some CoPs are initiated by DC member organisations but not in the framework of Delft Cluster programme. An example is NARIP (Nationaal Risico Platform bodemverontreiniging- http://groups.yahoo.com/group/narip). These Communities are in a way DC CoPs, regardless of not being set up and facilitated by DC. Accordingly, some steps are made to link activities of these Communities with Delft Cluster activities (in the case of NARIP - with DC Theme 5).

Concluding comments

Delft Cluster research projects are feeding ground for future Delft Cluster Communities of Practice. Assistance to collaboration in DC projects is also a contribution to emergence of DC Communities. Yet, some additional activities are needed to enable transition of Project Teams into Communities of Practice. The most important is stated below:

A simple and clear concept of CoPs should be prepared and made available to DC researchers.

This activity needs no gathering of additional knowledge on CoPs; it is primarily matter of systematisation and presentation. A concept should be accompanied with a procedure for its implementation. It is crucial to made DC researchers aware (especially in the last year of project activities) of the CoP-concept, its purpose and the implementation requirements.

CoP concept could (and should) be used to foster preparation of project proposals for ICES III programme. This needs to be communicated to DC researchers too.

Some DC CoPs are already emerging (Sedimentation Model.., Delft Systems), others are yet to come. The CoP-concept will be constantly upgraded according to experience gained in emerging communities. It is therefore important to make effort *to implement (test) the concept in one or more emerging CoPs.*

Concept preparation, its communication to potential users and its testing are recognised as main CoP-project activities in the last project year.

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:

Research Theme	:	Knowledge management		
Baseproject name	:	Communities of Practice		
Project name	:	Collaborative working in Delft Cluster: Setting Up Communities of Practice		
Projectleader/Institute		Dr. Ir. N. Kukuric		TNO-NITG
Project number	:	DC 07-03-01		
Projectduration	:	01-04-2000	-	31-12-2002
Financial sponsor(s)	:	Delft Cluster		
		TNO-NITG		
		IHE		
		Telematica Institute		
		NetCoast		
		NWP		
Projectparticipants	:	TNO-NITG		
		IHE		
		Telematica Institute		
		NetCoast, NWP		
Total Project-budget	:	€ 591.717		
Number of involved PhD-students	:	0		
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.

Keverling Buismanweg 4
Postbus 69
2600 AB Delft
The Netherlands

Tel: +31-15-269 37 93
Fax: +31-15-269 37 99
info@delftcluster.nl
www.delftcluster.nl

Theme Managementteam: Ground and Construction

Name	**Organisation**
Prof. Dr. R.K. Price	IHE
Prof. Dr. A. Mynett	WL

Projectgroup

During the execution of the project the researchteam included:

Name	**Organisation**
N. Kukuric	TNO-NITG
S. Velickov	IHE
D. Solomatine	IHE
S. Dzenisenka	IHE

Other Involved personnel

The realisation of this report involved:

Name	**Organisation**
J. van der Spek	Telematica Institute
E. Kruisinga	CIBIT