Delft Cluster

Title:	**Knowledge transfer in water management:** **a communication perspective**

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Abstract

We have performed an extensive search into the success and failure factors of knowledge transfer processes (KTPs) from knowledge suppliers (like WL | Delft Hydraulics.) to public clients dealing with water management (like RWS). During this search we used tools like discussions and workshops to mobilize the tacit experience of suppliers, knowledge mediators and clients, templates of analysis to analysis actual cases of KTP (by filling in the template through interviews) and explicit knowledge like literature review to refine our template for evaluation, and interpret our results.

In general complex processes like KTP for the public sector cannot be completely and deterministically explained. They can be framed in a certain manner yielding insight in this manner. In this report three methods of framing are given: the first (chapter 3) discusses KTP from the point of view of noise in communication between a sender and a receiver and a synthesis with the specific characteristics of KTPs in policy and decision making. What causes noise in the communication in a KTP? And how can both client and supplier come to congruence and overcome the noise. The final template for evaluation is an operationalisation of Chapter 3 in a tool that can be used to either analyse or design a KTP. Following the different questions and assignments yields insights in the KTP at hand.

The third method of framing is given in the discussion: here the scales of use (valid, applicable, applied, effective) are used to order failure factors from literature. The scales of use are connected to organisational units that will apply the new knowledge: from concrete data and supplier to use in a societal and political context. All methods of framing yield important insight in how a KTP can be designed.

General conclusions on KTP and for Dutch watermanagement specifically

Both in general KTPs and in KTP in Dutch watermanagement we can conclude that all parties involved (clients, supplier and related actors involved) should realize the following:

1) In general a knowledge gap has an interest not only for the client himself but also for stakeholders and actors related to the client. Therefore it is important that the communication of question is emphatically and consciously organized. It should be determined:
   a) Who has which interest (in terms of system implications or administrative consequences) in the answer yielded. Who will be affected by the implementation of the results?
   b) Did those actors have their impact and influence on the formulation of the question?
2) The client needs a process of sense-making in his own organization to accept and to decide to use the new knowledge. The sense–making can be stimulated by:
   a) a more conscious choice of participating in the knowledge generation
   b) organizing a review process along the process of knowledge generation in which members of the client's organization participate. Those reviewers should be representing both the client's organizational culture as well as the prevailing policy paradigm.
3) Both client and supplier should realize that the ultimate use of knowledge is a political decision: some knowledge will not be used because it does not fit/suit the enduser, no matter how well designed the KTP was or how valuable the actual results
4) Both client and supplier should realize that both timing of release and form of dissemination (presentation) can increase the chance of use.
5) The template for analysis we have developed, helps in raising awareness that the above mentioned points are important. By filling in the questionnaire, both supplier and client can design a more appropriate KTP. In this manner they can take care that the question is answered with the appropriate context (interests of stakeholders and potential use in the process of decision making) considered, in a careful designed process (where the new knowledge is carefully embedded in the client's organisation).

PROJECT NAME:	**Knowledge transfer in watermanagement: a communication perspective**	PROJECT CODE:	**03.04.01**
BASEPROJECT NAME:	**Connection with end-user**	BASEPROJECT CODE:	**03.04**
THEME NAME:	**Coast and river**	THEME CODE:	**03**

Executive Summary

Motivation for the study

In the past decade, several initiatives have been taken to stimulate scientific research with high societal impact. The CUR, the LWI programme and the Fifth Framework of the European Union all aimed to enhance the transfer of knowledge generated by universities and research institutes to industrial sectors, in particular to the water ways and road construction industry. The results so far are encouraging, but not sufficient. Within the LWI program, for example, a variety of decision support systems, interactive simulations and visualisation techniques have been developed. Practice shows that it is very difficult, still, to introduce effectively these tools in the policy process. This can in part be ascribed to the way in which these tools have been designed and implemented, and indeed there is room for improvement in this respect. But an important lesson learnt from these past efforts is that IT-based tools alone cannot bridge the gap between the creation of knowledge and the application of knowledge in public policy and management. A deeper understanding of the mechanisms of knowledge transfer processes (KTPs) and how they function in this sector is needed, enabling the development of methods and tools that focus specifically on the *transfer* of knowledge, rather than on the particular knowledge content. For this reason, most of the Delft Cluster research on knowledge management aims to enhance the dissemination and availability of the knowledge products to potential clients.

Aim of the study

The project DC 03.04.01 focuses on the interaction between specialists and end users, with the purpose to create mechanisms to improve knowledge transfer between these two parties. The term 'mechanisms of knowledge transfer' opens an enormous field of research, ranging from the psychology of didactics to institutional learning. In our research, we focus specifically on the 'appropriateness' of the knowledge delivered by specialists in view of the knowledge gap of the end users. What is the knowledge required by the end users to do their work, and what of this knowledge do they have and what do they lack? Is the knowledge supplied by the specialists valid? Is it applicable to the problems the end users want to solve? Is the knowledge applied correctly, and is its application indeed effective?

The first thing required to be able to answer these questions is a tool for analysis. In this study we intend to generate a *template for evaluation* that provides the means to first describe and then analyse and diagnose the process of the definition of the knowledge gap, the knowledge generation, and the knowledge transfer between the person(s) with the need (client) and the person(s) with the abilities (supplier). The template can be used as a research tool to investigate the appropriateness of the knowledge delivered to fill the knowledge gap defined. The tool is intended for application in knowledge intensive environments like the Technical Science Institutes of the Directorate-General of Public Works and Water Management (RWS) like the Dutch National institute for Marine and Coastal Management (RWS-RIKZ) or the large centres for technological improvement (GTI's) like WL | Delft Hydraulics.

Approach

We have performed an extensive search into the success and failure factors of knowledge transfer from

knowledge suppliers (like GTI's as WL | Delft Hydraulics.) to public clients dealing with water management (like RWS-DWW and RWS-RIKZ). During this search we used tools like discussions and workshops to mobilize the tacit experience of suppliers, knowledge mediators and clients, templates of analysis to analysis actual cases of knowledge transfer (by filling in the template through interviews) and explicit knowledge like literature review to refine our template of analysis, and interpret our results.

Results

In general complex processes like KTP for the public sector cannot be completely and deterministically explained. They can be framed in a certain manner yielding insight in this manner. In this report three methods of framing are given: the first (chapter 3) discusses KTP from the point of view of noise in communication between a sender and a receiver and a synthesis with the specific characteristics of KTPs in policy and decision making. What causes noise in the communication in a KTP? And how can both client and supplier come to congruence and overcome the noise.

The final template for evaluation is an operationalisation of Chapter 3 in a tool that can be used to either analyse or design a KTP. Following the different questions and assignments yields insights in the KTP at hand.

The third method of framing is given in the discussion: here the scales of use (valid, applicable, applied, effective) are used to order failure factors from literature. The scales of use are connected to organisational units that will apply the new knowledge: from concrete data and supplier to use in a societal and political context. All methods of framing yield important insight in how a KTP can be designed.

Conclusions

General conclusions on KTP

Both in general KTPs and in KTP in Dutch watermanagement we can conclude that all parties involved (clients, supplier and related actors involved) should realize the following:

1. In general a knowledge gap has an interest not only for the client himself but also for stakeholders and actors related to the client. Therefore it is important that the communication of question is emphatically and consciously organized. It should be determined:
   1.1. Who has which interest (in terms of system implications or administrative consequences) in the answer yielded. Who will be affected by the implementation of the results?
   1.2. Did those actors have their impact and influence on the formulation of the question?
2. The client needs a process of sense-making in his own organization to accept and to decide to use the new knowledge. The sense–making can be stimulated by:
   2.1. a more conscious choice of participating in the knowledge generation
   2.2. organizing a review process along the process of knowledge generation in which members of the client's organization participate. Those reviewers should be representing both the client's organizational culture, deciding authority as well as the prevailing policy paradigm.
3. Both client and supplier should realize that the ultimate use of knowledge is a political decision: some knowledge will not be used because it does not fit/suit the end-user, no matter how well designed the

KTP was or how valuable the actual results
4. Both client and supplier should realize that both timing of release and form of dissemination (presentation) can increase the chance of use.
5. The template for analysis we have developed, helps in raising awareness that the above mentioned points are important. By filling in the questionnaire, both supplier and client can design a more appropriate KTP. In this manner they can take care that the question is answered with the appropriate context (interests of stakeholders and potential use in the process of decision making) considered, in a careful designed process (where the new knowledge is carefully embedded in the client's organisation).

Specific conclusions on KTPs in Dutch watermanagement

Above general conclusions are valid for the Dutch KTPs in watermanagement. KTPs in Dutch watermanagement are generally well designed. The knowledge generated is of high quality (=valid). Given the complexity of the public sector, the knowledge is usually applicable although both supplier and client could be more aware that the question should be formulated with the appropriate context. An underestimated aspect of making knowledge applied is "sense making by the client's organization". This is mentioned in literature but not in the workshops. It seems underestimated/not recognized by suppliers and clients. By being aware of sense making, a client could emphatically discuss the new knowledge within his own organizational culture to position, integrate and apply the new knowledge more smoothly. The political context makes new knowledge applied and effective. But also in Dutch watermanagement one cannot prevent that is a political choice to use new knowledge or not. Suppliers can only accept that.

Recommendations for further research and application in the sector

The term 'knowledge transfer' opens an enormous field of research ranging from the psychology of didactics to institutional learning. In our research we focused on the direct fit of the answer delivered and the applicability to fill the knowledge gap defined. Is the answer valid, applicable, applied and effective? First thing necessary to answer these questions is a tool for analysis. In this study we have generated a *ex post* template for evaluation: first to describe, then to interpret the organisation of the definition of the knowledge gap, the knowledge generation and –transfer between the person with the need (client) and the person with the abilities (supplier).

The analysis template can be used as a research tool to investigate the earlier mentioned fit between knowledge gap and answer delivered. Ideally the tool is applied in knowledge intensive environments like the Technical Science Institutes of the Dutch National institute for Watermanagement or the large centres for technological improvement (GTI's).

Plan for research (= plan for application)

Coming period the final template of evaluation needs to be applied to various KTPs. The template is applicable for already answered knowledge questions (*ex post*) and for knowledge questions to be answered (*ex ante*). We see potentials to apply the template in large knowledge intensive organisations like the RWS-DWW, RWS-RIKZ and RWS-RIZA. In addition the template could be in projects that have a bridge function between the Delftcluster and ICES-KIS 3. The template is especially suitable to design a research plan in those situations where the market sector is the knowledge client.

Research questions for ex post evaluation

The intention is to apply the template to various KTPs in a number of organisations. Questions of relevance:

- Within an organisation comparison: does an organisation have failures in KTPs? Is this each time due to a different failure factor or does the comparison of cases reveal a pattern?
- Between organisations: Comparing organisations, is there a bias between types of organisations and failure factors or do all organisations reveal the same pattern?

Research questions for ex ante evaluation

In general all participants of the final workshop thought that the final template in its present state it is a good tool to serve as a checklist in the end of an intake dialogue. Here it functions an *ex post* tool of evaluation for the intake. Positioned in the entire process, it still operates in the phase of problem definition: a potential *ex ante* tool to sharpen and crystallize the question of research. This leads to the following research questions:

Does the application of the final template for evaluation lead to an altering and sharpening of the question under investigation?

Can the final template be rephrased in such a manner that it can serve as a guidance tool of the intake rather than an evaluation of the intake?

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Knowledge transfer in water management: a communication perspective

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Contents

1 Introduction

The body of scientific knowledge is massive and expanding at an increasing rate. The Delft Cluster projects e.g. make their contribution by generating specific knowledge in the field of sustainable development of densely populated delta areas. This report intends to give some insights and help on how the transfer and use of this newly generated knowledge can be improved. It focuses on the knowledge transfer process (KTP).

1.1 The knowledge transfer challenge

In general, scientific knowledge is disclosed by means of reports, guidelines and handbooks, and also embodied in people as 'tacit knowledge' or 'experience'. To make use of this knowledge, first it has to be identified, then its carrier has to be localised, then one needs access to this carrier, and then the knowledge itself must be retrieved from its carrier in a way that will permit the client to apply this knowledge (see eg Kosten & van Workum, 2000).

Frequently, these conditions for knowledge use are not met. There are many examples of large infrastructure projects in which the available knowledge was not used at all, or not used effectively (e.g., because research results were interpreted erroneously) or efficiently (e.g., because the knowledge acquisition effort of the client was not proportional to the practical value of this knowledge). The inherent uncertainty in impact assessments and forecasts both complicates their interpretation and limits their practical value. Another complicating factor is that clients will by definition always have less knowledge than the experts who generate and supply knowledge, and therefore can be suspicious of knowledge and information that is supplied to them.

1.2 Knowledge management throughout the Delft Cluster

These difficulties in knowledge use and transfer pose a major challenge for all parties involved in knowledge-intensive processes. The Delft Cluster has taken up this challenge by defining *Theme 7: Knowledge Management* as a transversal area of research, crosscutting the six other themes of its research programme. For this Theme 7: Knowledge Management, three levels of ambition are distinguished:

1. To effectively support innovative research within the six other research themes. The emphasis is on developing a working culture in which virtual (knowledge) teams co-operate via the network, share know-how, and have access to relevant information and facilities that improve the potential for innovation. They can also search for links with organisations that have knowledge and expertise in overlapping fields of know-how. Delft Cluster is responsible for distributing research findings.
2. To expand on the basis that has been established for international knowledge management. External interested parties are given interactive access to both explicit as well as tacit knowledge.

3. To explore and implement the concept of knowledge brokering: the exchange of proven know-how, provided by a group of involved parties with practical experience. The aim is to present creative approaches and solutions for problems faced by other involved parties within the group.

The central role of theme 7 is reflected in a number of initiatives and projects: It has central functions like:

Vision, Culture and learning

- *Measuring Knowledge Management Progress: Application of KnowMe in Delft Cluster*. This project is aimed at measuring and improving the performance and progress in knowledge management of DC themes and projects, and to develop understanding and commitment by all DC-members for needed interventions and actions.
- *External Review on Delft Cluster Knowledge Management***:** to improve the knowledge management processes in DC by involving Cap Gemini Ernst & Young and KPMG as external organisations to create a high level plan of action.
- *Knowledge exchange with ONRI-partners:* understanding and connecting the knowledge needs of (ONRI) consulting engineering firms with the knowledge focus of the Delft Cluster Programme.
- *An inquiry into learning systems for Delft Cluster.* The intention of this project has been to investigate the modelling of the learning processes of civil engineers in DC, to identify the knowledge transfer/exchange processes needed, and to create a framework for addressing the development of an organizational learning system.

Corporate Knowledge Platform

- *Implementation of a DC Intranet*. It was recognised early on in the proposal development for knowledge management that there was a need for a basic Intranet to provide access to approved documents and registered information
- *Review of DC Intranet and Internet.* Developments in the concept and implementation of platforms for access to information and communication with others have lead to the perceived need for a review of emerging platform technologies.
- *DC Corporate Knowledge Map: Specification, Design and Prototype.* The primary objective of this project is to design, specify and implement a prototype DC corporate knowledge map.
- *Digital site hut.* This project is exploring the possibilities for engineering consultants and contractors at distributed sites to improve their communication and collaboration using broadband network links.

Communities of Practice

- *Collaborative working in Delft Cluster: Setting up Communities of Practice.* This project aims to identify the specific needs and requirements of DC related to collaborative working through working with the Themes on knowledge management projects, and to develop a concept for Communities of Practice.
- *Knowledge Sharing in DC Communities of Practice.* This project addresses the nature and dynamics of distributed knowledge sharing in DC, and differentiates between technological, organisational and social conditions that facilitate and/or hinder knowledge sharing.

Document and Content Management

- *Document management: review and strategy.* A basic need within DC is for a review of existing documentary information resources in the libraries of DC

members and on scientists' desktops, and to develop a strategy to store all relevant DC documentary information in such a way that it is readily available and retrievable.

- *Delft Cluster Knowledge Exchange Facilities.* Following on from the review project will be the specification, design and implementation of a (document) content management system that facilitates the exchange of information in whatever form between DC members and between DC members and related persons.
- *Building a Prototype Hybrid Information Centre.* Here the aim is to build a working prototype Hybrid Information Centre that provides transparent access to all needed public information sources for DC, and to provide public access to appropriate DC information sources.
- *Text Mining for Document Management.* Given the value of documents, it is also necessary to investigate the needs for text analysis tools aimed at automated extraction and generation of technical knowledge from unstructured text information such as technical reports, e-mails, web pages, news feeds, user documents and other "grey" literature.

Encapsulated Knowledge Systems

- *DC Open Modelling System.* It is recognised that the cultural trend in management is towards a more holistic, integrated view of systems in densely populated delta areas. This applies in particular to modelling. Yet simulation models in water, soils and for structures have been developed separately in the past. Therefore there is a need to bring together different modelling systems through acceptance of particular standards.
- *Data Mining, Knowledge Discovery and Data-Driven Modelling*. The aim of this project is to design and develop prototypes of data mining, knowledge discovery and data-driven modelling tools, to make them available within DC networked environment, and to support the introduction of the new working practices and procedures, taking into account the possible cultural and sociological aspects.

The knowledge and experience of theme 7 was used in the projects of other themes where e.g. different aspects play an important role in the project that are closely related to knowledge management. Examples are the handling of large amounts of data and interpretation techniques of data. Most of the other themes within the Delft Cluster also address the issue of knowledge management:

Theme 1: Soils and structures involves, among other projects, the development of a digital knowledge platform. The digital knowledge platform should stimulate and facilitate bi-directional knowledge exchange between research and practice. The project focuses on the following aspects:

1. Expectations and valuations of users with regard to a digital knowledge platform as an addition to other channels for knowledge exchange.
2. Thresholds and impediments for knowledge exchange.
3. State of the art knowledge platform models.
4. Monitoring of user behaviour.

In *Theme 3: Coast and river*, three projects have been defined that explicitly address knowledge management as a relevant activity, focusing on these central aspects:

1. Interaction between end-users and specialists: how to create mechanisms to realise this.
2. Interaction amongst specialists: how to create the right environment.

3. Knowledge bank: how to create an ICT-based system to disseminate knowledge on civil engineering and hydraulic engineering through a variety of portals to a variety of end users.

Theme 4: Urban Infrastructure pays attention to the use of ICT tools in information sharing and decision-making processes. Part of the research investigates the applicability of various procedures, models and tools for exchange and visualisation of information and for decision making concerning complex urban infrastructure projects. The central question is how these models and tools can help to increase the synergy of solutions, and how the urban infrastructure sector can be motivated to adopt these models and tools in particular, and knowledge management in general.

One of the projects in *Theme 5: Subsurface management* addresses the issue of knowledge management by looking into ways to improve the accessibility of knowledge for clients, e.g., by developing a gate of access for potential knowledge clients and suppliers, and creating a virtual community in which clients and suppliers actually meet and exchange knowledge and insights.

In *Theme 6: Integrated water resources management* the project 'IT and Knowledge Management' interfaces strongly with the other projects in this theme and also serves the purpose of linking Theme 6 with Theme 7. It investigates how modern information and communication technology can be used to exchange knowledge about integrated water resources management.

As its project code (project DC 03.04.01) suggests, the study presented in this report is the completion of the first aspect (improving the interaction between end-users and specialists) covered by sub-theme 4 (knowledge management) of Delft Cluster *Theme 3: Coast and river*. This project yields information that can be used in ambition 3 of theme 7.

1.3 Motivation for this study

In the past decade, several initiatives have been taken to stimulate scientific research with high societal impact. The CUR, the LWI programme and the Fifth Framework of the European Union all aimed to enhance the transfer of knowledge generated by universities and research institutes to industrial sectors, in particular to the water ways and road construction industry. The results so far are encouraging, but not sufficient. Within the LWI programme, for example, a variety of decision support systems, interactive simulations and visualisation techniques have been developed. Practice shows that it is very difficult, still, to introduce effectively these tools in the policy process. This can in part be ascribed to the way in which these tools have been designed and implemented, and indeed there is room for improvement in this respect. But an important lesson learnt from these past efforts is that IT-based tools alone cannot bridge the gap between the creation of knowledge and the application of knowledge in public policy and management. A deeper understanding of the mechanisms of knowledge transfer and how they function in this sector is needed, enabling the development of methods and tools that focus specifically on the *transfer* of knowledge, rather than on the particular knowledge content. For this reason, most of the Delft Cluster research on knowledge management aims to enhance the dissemination and availability of the knowledge products to potential clients.

1.4 Aim of the study

The project DC 03.04.01 focuses on the interaction between specialists and end users, with the purpose to create mechanisms to improve knowledge transfer between these two parties. The term 'mechanisms of knowledge transfer' opens an enormous field of research, ranging from the psychology of didactics to institutional learning. In our research, we focus specifically on the 'appropriateness' of the knowledge delivered by specialists in view of the knowledge gap of the end users. What is the knowledge required by the end users to do their work, and what of this knowledge do they have and what do they lack? Is the knowledge supplied by the specialists valid? Is it applicable to the problems the end users want to solve? Is the knowledge applied correctly, and is its application indeed effective?

The first thing required to be able to answer these questions is a tool for analysis. In this study we intend to generate a *template for evaluation* that provides the means to first describe and then analyse and diagnose the process of the definition of the knowledge gap, the knowledge generation, and the knowledge transfer between the person(s) with the need (client) and the person(s) with the abilities (supplier). The template can be used as a research tool to investigate the appropriateness of the knowledge delivered to fill the knowledge gap defined. The tool is intended for application in knowledge intensive environments like the Technical Science Institutes of the Directorate-General of Public Works and Water Management (RWS) like the Dutch National institute for Marine and Coastal Management (RWS-RIKZ) or the large centres for Knowledge and technology (GTI's) like WL | Delft Hydraulics.

The most important achievement is that we have generated a template for evaluation that can be used to design a process of knowledge transfer. Applying the template makes both the knowledge supplier and the knowledge client aware how they could improve the question formulated and the answer given. In this manner they can take care that the question is answered with the appropriate context (interests of stakeholders and potential use in the process of decision making) considered, in a careful designed process (where the new knowledge is carefully embedded in the client's organisation).

1.5 Outline of the study and this report

The study that is presented in this report has involved a mix of conceptual and empirical inquiries in a variety of theoretical fields and application areas. To give the reader an overview of the research approach and the way it developed as new insights were obtained, we first describe the course of our investigations (chapter 2). We then focus on the development of the conceptual framework that constitutes the basis for the analytical tool we are looking for (chapter 3). Having motivated our choice of concepts, we present our *template for evaluation of a KTP* (chapter 4). In the subsequent discussion (chapter 5) we elaborate on the literature, position the template in this field of literature (show the added value) and discuss how it is received by potential users. We conclude this report with conclusions and a number of recommendations with respect to the use of the template and the unresolved issues that deserve investigation in future research projects (chapter 6).

2 Course of our investigations

Given the ultimate objective of improving KTPs, the immediate objective of the project is to provide the means to diagnose the effectiveness of such KTPs. In this chapter 2, the subsequent steps are described we took in developing the template for evaluation of a KTP (defined in chapter 4).

Soon after the start of the project, it became clear that the body of knowledge pertaining to our topic is as extensive as it is diverse. There seemed little need of adding new concepts or theories. Instead, we should address the question when to apply which theory, or, more specifically:

> *Which conceptual models are suitable to describe, analyse, and interpret a given knowledge transfer process (KTP) in ways that will*
> - *allow analysts to establish the effectiveness of this KTP,*
> - *help them understand why this KTP is more or less effective than other KTPs, and*
> - *guide them in their attempts to improve this KTP or future processes.*

Answering this question would produce a template for evaluation (a set of models and guidelines). The template for evaluation would be (adaptations of) concepts and theories found in the literature; the guidelines in it would be elicited from observed best practices, experiments and literature. Thus, the new knowledge to be generated by the project should be 'know how' and 'know when' knowledge on organising a KTP in a form that is practical for analysts (consultants, facilitators, knowledge brokers, process managers). It is intended to contribute to a more effective transfer of knowledge (in particular in the area of water management, since the project is part of *Delft Cluster Theme 3: Coast and river*).

Although in its practical execution it often required a heuristic process of several iterations, our approach essentially comprised this sequence of steps.

1. *Global inventory*: By exploring theoretical work and matching this to experience from professional practice, a first descriptive model of KTP and subsequently an initial template for KTP evaluation were constructed.
2. *Application of the initial template*: This initial template for evaluation was applied to a number of real-life cases of knowledge transfer in the area of water management, and subsequently evaluated for its applicability.
3. *Improvement*: Analysis of the cases confirmed that a template for evaluation to establish the effectiveness of a KTP can lead to relevant insights, but it also revealed a number of important omissions. While continuing to explore the literature, the initial template for evaluation was modified in a process of iterative applications to, and evaluations of, the cases.
4. *Consolidation*: The result of this process was submitted for feedback in a final workshop with its potential end-users, and consolidated in its present form: the final *template for evaluation of a KTP* in chapter 4 of this report.

2.1 Global inventory

Many conceptual models and theories on knowledge transfer in water management can be found in a wide range of disciplinary fields: basic epistemology, research methodology, cognition, communication, learning, psychology, sociology, organization, management, economics, politics, and more. Based on literature (Twaalfhoven, 1999, literature used in van Koningsveld, 2003) and discussions, we posed the following assumptions and points of departure:

1. Knowledge transfer implies a situation involving two parties and the existence of a 'knowledge gap' between them.
2. The transfer of knowledge occurs in a process of communication.
3. The KTP between the two parties involved does not occur in isolation. The template should address the context of both parties and the way this context affects the KTP.
4. There is some kind of utility associated with the transfer of knowledge between these two parties. The template should facilitate the identification and operationalisation of this utility as a measure for the effectiveness of the KTP.

Based on the assumptions 1 and 2, we derived a first descriptive model (section 2.1.1, Rozemeijer, 2003). To meet points of departure 3 and 4, different levels of use and effectiveness were defined and for two levels of use, associated "initial" criteria were defined as well (2.1.2). These initial criteria were consolidated in an initial workshop (2.1.3).

2.1.1 A first descriptive model of a KTP

Using the assumptions 1 and 2 as reference point, we have developed a first descriptive model of a KTP that allowed us to identify the criteria for effective knowledge transfer between researchers/consultants and policy makers, and the factors that determine the outcome of a KTP of these criteria.

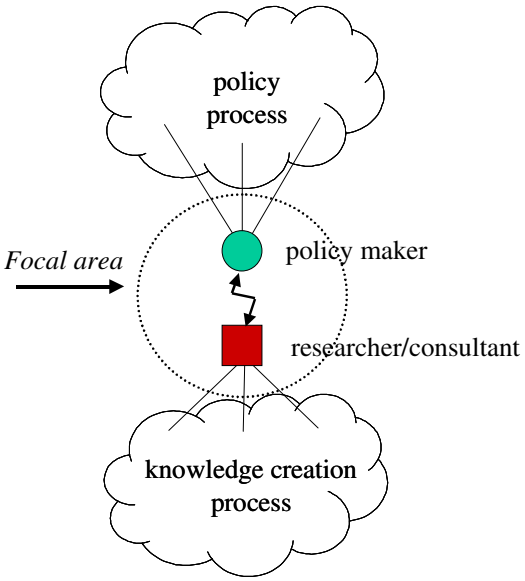


Figure 2.1. Knowledge transfer as area of interest

Figure 2.1 shows the initial demarcation of the area of interest: the interaction between on the one hand actors with policy making capability, involved in some policy making process, and on the other hand actors with research/consulting capacity, connected with a more or less extensive knowledge network. The KTP is seen as a sequence of interactions between client and supplier and their environment, in which both parties learn (Bots et al., 2003).

To assess the quality of the knowledge transfer between policy maker and researcher/ consultant, we assumed the following:

- The policy maker has a knowledge demand, which we will refer to as a 'question'. This question may be ill-defined and rife with tacit assumptions.
- The researcher/consultant can supply knowledge, which we will refer to a an 'answer' to the policy maker's 'question'.
- The effectiveness of the knowledge transfer can be defined as the extent to which the answer 'fits' the question.
- The 'fit' will be affected by the interaction process between policy maker and researcher/ consultant, and – directly or indirectly – by contextual factors (characteristics of the policy process and the knowledge network, institutional and organizational aspects, etcetera)

2.1.2 Effectiveness of knowledge transfer at different levels of use by actors

The effectiveness of knowledge transfer is defined as the extent to which the researcher/ specialist supplies the policy maker with an adequate and consequential answer to his question. Both the effectiveness of knowledge transfer and possible explanations why this effectiveness is less than optimal, can be considered at different levels, cf. Figure 2.2.

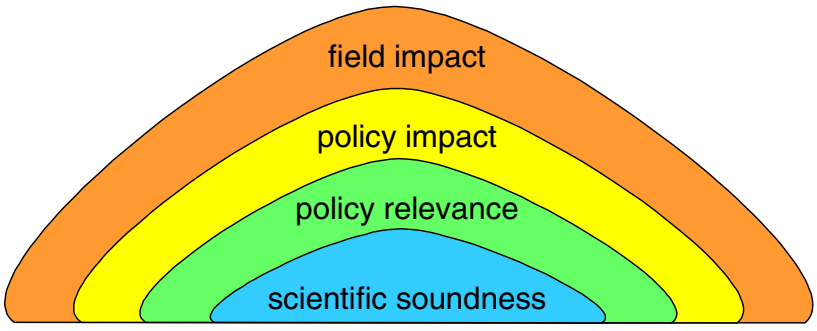


Figure 2.2. Different levels of knowledge transfer effectiveness

Level 1: The knowledge is scientifically sound and valid

At this level, we limit ourselves to the substantive aspect of knowledge. Knowledge transfer is effective if the knowledge that is generated is scientifically sound and provides the answer

to the questions as they have been posed by the policy maker. This level is associated with the knowledge generation process and the researcher/consultant in fig. 2.1.

Example 1A: A coastal zone manager asks for the erosion that can be expected as an impact of constructing a lateral dam. A consultant calculates a range of scenarios and presents the results, which have a wide range due to uncertain system variables. The coastal zone manager accepts the report. He understands the figures quite well, but because of the wide range he cannot give a sharp budget estimate for sand supplements.
Verdict: The knowledge transfer is effective, because the answer is scientifically sound and it fits the question well.

Example 1B: Suppose that the consultant's report had not shown the erosion, but only the changes in currents and sand transport, i.e., important intermediate variables, but not the one of interest.
Verdict: The knowledge transfer is ineffective, because the answer does not fit the question. This 'misfit' could be the result of several causes:

- The question was not clearly or incompletely stated by the coastal zone manager.
- The consultant did not have the knowledge (e.g., computational models) to determine the variable that was asked for, so he used related variables instead.
- The fitting answer could not be delivered due to circumstances, e.g., because the model expert was on holiday, or the project budget was too tight to cover the final conversion and interpretation.

Level 2: The transferred knowledge is applicable (policy relevance)

At the second level we also take into consideration the potential for practical application of the knowledge. Knowledge transfer is effective if the knowledge fulfils the actual need of the policy maker, a need that may be different (in scope and detail) from the questions as posed by the policy maker. The knowledge (e.g., the model or decision support system that was constructed by the supplier) is such that it gives the policy maker insight in the (impacts of) different autonomous developments and/or policy options. Effectiveness on level 2 presupposes effectiveness on level 1 (the knowledge must be sound and valid and the concepts must be understood by the policy maker), but goes beyond in the sense that the policy maker can act upon the supplied knowledge, e.g., make decisions. Level 2 is associated with the hooked double arrow and the policy maker in fig. 2.1.

Example 2A: Suppose that the consultant's report contains an accurate prediction of erosion that is robust for a wide range of scenarios. The coastal zone manager can combine the erosion figures with detailed historic data on the cost of sand supplements, and thus make a sharp budget estimate.
Verdict: The knowledge transfer is effective, because the answer improves the policy maker's task performance. Without the supplied knowledge, his budget estimate would not have been as good.

Example 2B: The consultant's report contains an accurate prediction of erosion that is robust for a wide range of scenarios, but the policy maker has only global figures on the impact and cost of supplements. In his budget estimate, he indicates an uncertainty margin of ± 50 %.

Verdict: The knowledge transfer is ineffective, because the answer does not improve the policy maker's task performance. His estimate is about as crude as it would have been without the consultant's report.

Level 3: The transferred knowledge is applied (policy impact)

At the third level, we consider the actual use of the knowledge by the policy maker. More specifically, we look at the policy maker's problem solving behaviour: to what extent does the knowledge that is supplied affect the way he frames the policy problem, the options he identifies, and the choices he makes? The transfer of knowledge is effective if the policy maker's behaviour shows that this knowledge is interpreted correctly, and that it is acted upon in a rational way. Effectiveness on level 3 presupposes effectiveness on level 1 (the knowledge must be sound and the concepts must be understood by the policy maker) and effectiveness on level 2 (application of the knowledge contributes to dealing with the policy problem), and in addition requires a 'fit' between the knowledge, the policy situation, and actual policy making behaviour. Level 3 belongs to the policy process in fig. 2.1.

Example 3A: The coastal zone manager submits a budget that is consistent with the most likely erosion scenario in the consultant's report and the available cost figures on sand supplements. In his budget proposal he mentions the uncertainty margin, albeit slightly narrower than the rang defined by the extreme scenarios in the report.
Verdict: The knowledge transfer is effective, because the policy maker makes good use of the answer (choosing a high probability range) while trying to come up with a sharp cost estimate.
Example 3B: For strategic reasons, the policy maker gives an estimate for the cost of sand supplements that is 25% above the most likely scenario in the report. He makes explicit reference to the consultant's report while emphasising the possibility of strong currents damaging the coast line.
Verdict: The knowledge transfer is effective, because the policy maker makes good use of the answer (highlighting the information in the strong erosion scenario) while trying to acquire a generous budget.
Example 3C: The policy maker submits a budget that is 10% above that of the previous year, arguing that the slight surplus on the budgets of the past three years reflect a supplement-in-big-steps-when-you-know-where it's-needed strategy, and that this year it is time for a big step.
Verdict: Even if the budget would be the same as in example 3A or 3B, the knowledge transfer is ineffective, because the policy maker makes no use of the answer (the proposal is not based on expected erosion levels).

Level 4: The application of knowledge is effective (field impact)

It is tempting to define the ultimate effectiveness of knowledge transfer as the next step in the causal chain: knowledge in the hands of an actor leads to action which causes certain changes (effects) to occur. However, determining whether policy decisions are effective, i.e., produce the intended effects, is problematic. Intended effects may occur regardless of policy interventions (autonomous trends) or they may fail to occur (because of external influences) even though the policy interventions were well chosen.

At the fourth level, we therefore prefer to look at knowledge transfer in a broad sense, i.e., as the dissemination of knowledge from the 'scientific network' to the 'policy network'. With these 'networks', we refer to the actors (both individuals and organisations) involved in, respectively, the knowledge generation process and the policy process in Figure 2.1. The transfer of knowledge is effective if the generated knowledge is used appropriately in decision making. This means that we broaden the scope from the perception and choices of the policy maker as an individual to the perceptions and choices of all who are involved in the policy process. Knowledge transfer is effective if it finds its appropriate application not only by the policy maker who solicited for the knowledge (as client), but throughout the policy field. In other words, when the knowledge is disseminated, and adopted and acted upon by all stakeholders. Usually, this will require knowledge transfer effectiveness on levels 1, 2 and 3. Level 4 belongs to the policy process in fig. 2.1.

Example 4A: Suppose that the sand supplement budget proposal is part of a coastal zone policy process that also includes the option of building dams. The proponents of dams argue that this investment may give better flood protection and also reduce the need for sand supplements. The scenarios in the consultant's report differ from those in some other consultant's impact assessment for various types of dams. This triggers discussion in several clusters within the coastal zone policy network, some emphasising the technical aspects (trying to align the different model results), others the financial aspects, and again others the ecological impacts. Eventually, their perceptions converge to the point where agreement can be reached, and the 'negotiated knowledge' they have thus created contains much of what is in the original consultant's report.
Verdict: The knowledge transfer is effective, because the policy maker's budget proposal triggers a discussion in which the answer to the policy maker's original (relatively narrow) question plays a significant role. In this discussion, which is in part scientific and in part political, stakeholders try to reconcile knowledge from different sources, and the original answer has clearly influenced the policy field.
Example 4B. The budget proposal prepared by the policy maker (*note*: it is irrespective whether this is the one from example 3A, 3B or 3C!) is accepted as realistic. The alternative policy proposal involving the construction of a dam requires a budget that is ten times higher, and is brushed aside without in-depth discussion.
Verdict: The knowledge transfer is ineffective, because the answer does not even reach stakeholders other than the policy maker who drafted the budget. The important policy decisions are made without substantive learning on the part of the decision makers. (*note*: the verdict would have been the same if the dam alternative had been chosen).

Understanding KTP effectiveness

This distinction between four levels of effectiveness is intended to structure the complex of factors that through their causal interaction determine the success or failure of a KTP. At each level, we consider the interaction between knowledge client and knowledge supplier as a system, with a number of knowledge transfer success indicators as the *outputs* and a number of situation parameters as the *inputs* at a particular level. The knowledge transfer success indicators should serve to establish the effectiveness of the KTP, and investigating their relation with the situation parameters should help us understand why this KTP is more or less effective, and provide guidance for improving this KTP or future processes.

First limiting of the scope of the research

To reduce the scope of analysis, we decided to focus primarily on the first two levels: 'valid' and 'applicable'. Those two levels are directly determined by the characteristics of knowledge transfer assignment itself and the interaction between client and supplier. The next two levels are increasingly susceptible to external influences, which reduces our chances of being able to make validated recommendations for the knowledge transfer process.

Initial criteria for effective knowledge transfer

A typical consulting situation was used as the starting point for developing knowledge transfer success indicators. Based on personal experience of some of the research team members and Twaalfhoven (1999), a KTP in a consulting situation was seen to comprise 9 activities:

1. Interpretation of the question
2. Translation of the question in researchable sub-questions
3. Knowledge inventory: is state-of-the-art knowledge used?
4. Choice of model
5. Model development (optional)
6. Model operationalisation
7. Systems analysis using the model
8. Interpretation of the results
9. Reporting to the client

For each activity, we generated a range of criteria that should be satisfied for the KTP to be successful. These criteria were formulated as yes/no questions with a brief explanation. To verify and improve this list of criteria, we invited a number of professionals in the area of water management to a workshop.

2.1.3 Global inventory workshop

For the initial workshop, a broad representation of the professional field of integrated water management encompassing water- and coastal zone management related sectors (consultants, civil and hydraulic engineering enterprises, water management related professional organisations and government institutions) were invited, resulting in a number of participants who represented the water field to its desired extent. The workshop is extensively described in Bots et al. (2002).

Objectives of the workshop

The purpose of the workshop was to obtain the following information:

1. a complete and prioritised list of criteria for judging the quality of knowledge transfer;
2. examples, mini-cases, anecdotes, and references to literature that would help us understand practical successes and failures with knowledge transfer in consulting situations;
3. an overview of factors that might explain the problems encountered by knowledge transfer practitioners (the so-called *failure factors*).

With these objectives in mind, the participants were asked to prepare for the workshop by studying the criteria

1. Which of these specific criteria for the quality of knowledge transfer that have been derived form theory do you see as relevant? Can you give additional criteria?
2. Judging from your professional experience, what are the most important problems in the transfer and use of knowledge?
3. Can you think of particular explanations for these problems?

Conclusions of the workshop

The results of the workshop led to the following conclusions:

1. The first prioritisation by the workshop participants shows that they have a strong confidence in the knowledge and professional skills of the researchers/consultants: they judge the importance of the criteria pertaining to the technical aspects of doing substantive research to be relatively low, and they estimate the probability that the knowledge transfer fails due to errors in this area to be low. An important condition, however, is that sufficient data must be available.
2. The participants judge the quality of the formulation of the research question and the quality of the reports on the results to be of far greater importance. Most important is good insight in the context from which the question originates is. The information on what the policy problem is, and in particular what the 'knowledge gap' is (i.e., what the end user should know to make the right decisions *minus* what he/she already knows) constitute the most important failure factors.
3. The notion of the 'context of a question' is vague, and needs to be carefully operationalised in the next phase of this research project.
4. The participants found the aspect of interaction between researchers/consultants and their clients to be lacking. The process of knowledge transfer with its many interactions and iterations merits more attention than is presently reflected by the criteria.

Using these conclusions as guideline, the list of criteria was consolidated and subsequently converted to an initial template for evaluation (see appendix A). Conclusions 3 and 4 led to an extension of the theoretical frame for evaluation of knowledge transfer:

- *A consistent terminology was defined*. From this point onwards, the person(s) with a question will be addressed as 'knowledge client'. The person(s) with the ability to make new knowledge was defined being 'knowledge supplier'. In section 3.3, a more elaborate justification for this decision will be given.
- *Knowledge transfer is viewed as a process.* The knowledge (transfer) activities are considered with their interrelationships: temporal (sequence), substantive (input-output relations), personal (the actors that are involved), and special attention is given to moments of interaction and (substantive or procedural) feedback.
- *Substantive context:* The research question is viewed as part of a broader system of questions, and special attention is given to the way in which the question is split up in sub-questions.
- *Organisational context:* The knowledge transfer is positioned in a system of actors with their respective responsibilities and decision making authority, and special attention is given to how the actor positions and relations can facilitate or constrain the KTPs.

2.2 Application of the initial template for evaluation of knowledge transfer effectiveness

At this stage, an initial template was consolidated (appendix A). It was time to apply it to a number of real-life cases of KTPs in the area of water management, and subsequently evaluate it for its applicability. A number of steps was taken to apply the template:

1. Definition of the situations of KTP under research including a description of the cases
2. Application of the initial templates by means of interviews:
3. Findings, interpretations and improvement

2.2.1 Definition of the situations of KTP under research

The exact definition of the KTP success indicators (the dependent variables) and the situation parameters (the independent variables) are different for each level of use. In addition, the scope of the situation parameters (which determine the range of possible explanations for success or failure) will increase as the level of use increases (more widely applied). Conceptualising plausible explanations and then probing the scientific validity of these explanations will be difficult at the higher levels of use. To restrict the variety of KTPs somewhat, we focus on three particular types of knowledge transfer situations:

1. *Consulting situation:* A policy maker approaches a researcher/consultant with a specific question, and the researcher/consultant provides an answer (either an advice or applied research situation), usually by means of a written document (report).
2. *Guideline situation:* A group of researchers/consultants with different expertise make a knowledge compound (a handbook with guidelines) that is to serve a heterogeneous group of policy makers/clients in their decision making.
3. *Research-driven situation:* A group of researchers from different disciplines generates a complex body of knowledge related to some specific theme (e.g., coastal zone management) while neither the potential clients for this knowledge nor the specific questions they may have are known yet.

The decision to focus on these three types of knowledge transfer situations was primarily the result of the specific interests of the organisations who participate in this Delft Cluster research project. The consulting situation is of interest to all, as all participating institutions find themselves in this situation, most often in the role of researcher/consultant, but sometimes also in the role of policy maker. The Road and Hydraulic Engineering Division of RWS (RWS-DWW) took special interest in the guideline situation, as they were responsible for the development of the new Guideline Sandy Coasts, and may be involved in the development of other guidelines in the future. The research-driven situation was of interest to Delft Hydraulics and the University of Twente in particular.

Defining the cases

Using above definition of potential cases, we applied our initial template to the large applied research programme considering the Port of Rotterdam, a case on drinking water management, a guideline situation (guidelines sandy coasts) and one special case of fundamental research (COAST3D).

In essence the research programme the Port of Rotterdam (SM2V) was a programme of advice and applied research. In 1997 the Dutch cabinet decided that a solution had to be found for the increasing lack of space in the port of Rotterdam. In addition there was an increasing need to improve the quality of the social environment by increasing natural or recreational qualities. There too it was decide to start a Planological (basis) decision - procedure (PKB) together with a required Environmental Impact assessment (EIA) under the responsibility of the organisation Project Mainport Rotterdam (PMR). PMR was searching in three potential directions for solutions:

- a more efficient use of the space available in the port of Rotterdam
- a more efficient use of existing and planned industrial and harbour facilities in the region south-west of Rotterdam.
- an artificial peninsula (artificial peninsula Maasvlakte 2, MV2) attached to the already existing artificial peninsula Maasvlakte 1 (MV1) together with connected facilities for nature and recreation. The research for design and construction and the EIAs of all potential designs was co-ordinated and performed by Corporation Meuse peninsula 2. (SM2V).

We have chosen the large research programme of SM2V for our investigation for knowledge transfer because its large scale. It contains a large range of knowledge transfer situations ranging from almost fundamental research to direct advise and learning.

In addition we included a special and typical situation of the “guidelines sandy coasts”. Here, not clearly defined principles of policy and management are translated into factual guidelines by knowledge exchange amongst scientists and regional managers of a certain area.

Another typical advise situation is that of the management of drinking water facilities for Southwest Netherlands, in which was asked to define all relevant stakeholders involved in the drinking water facilities.

COAST3D is an example of a fundamental research driven situation where it was also tried to translate the results to managerial guidelines. This yielded two different clients. The different cases and their learning points will be briefly described below. Table 2.2 gives a short summary of the cases together with the results obtained. Appendix B gives a more elaborated description of the cases.

2.2.2 Applying the initial template by means of interviews

The interviews were executed according to a fixed protocol. The purpose of the protocol was to ensure that the different researchers in the project would apply a uniform method of interviewing in their divers case-studies. This would enhance integration and interpretation of the results. The protocol is extensively described in appendix C. In short the protocol was:

Preparation: document analysis

Selection of interviewees: on basis of the document analysis a list with potential interviewees was composed. The list contained representatives of both clients and suppliers. It was aimed that both the project manager of the client as well as the supplier would be interviewed.

1. Interviews: the interviews had the purpose to:
2. Validate the characterisation of the case (basic features, problem definition, outline of the research conducted and the application of the research);
3. Get insight in the "question behind the question" (does the problem definition give enough insight in the potential application of the results)?
4. Assure whether the list of potential interviewees is complete.
5. Get insight in the quality of knowledge transfer and what has determined the quality of the KTP (applying the initial template for evaluation).
6. Reporting: Each interview was carefully registered.. The reports (in Dutch) are available at the authors. Examples of interview sessions are given in Rozemeijer (2003).

Table 2.1 A detailing of the cases

Case	**Type of KTP[1]**	**Most aggregated interpretation of applying the initial template**
SM2V: Long term predictions on the development of the morphology of the mouth of the Haringvliet. Special attention was given to the uncertainties and (un)reliability of the prediction.	AR[1]	The importance of the direct use of the results by others than the direct client. What is the context of use.
SM2V: Reopening of the lake of Oostvoorne: a quickscan. A Quick scan was performed to inventory the potential of reconnecting the Lake of Oostvoorne as an alternative for natural and recreational impulses and as a compensation measure from judicial point of view.	Advice	The reuse of earlier produced results, the importance of a good process, and the acknowledgement that experienced people in both client and supplier enhances the change of success.
SM2V-related: The construction of MV2 could lead to a change of safety for the islands of Voorne and Goeree. RWS-DZH had ordered a report on the change in impact of waves on the dunes of Voorne and Goeree due to MV2, in relation the safety against flooding of these island.	Advice	The importance of the total realm of stakeholders: what is the context of stakeholders. And are they engaged in the process of making? Clients prefer a good process during the making (exchange of ideas and thoughts, redefinition of the question)
Management of drinking water facilities for Southwest Netherlands: define all relevant stakeholders involved in the drinking water facilities.	Advice	During the assignment, the communication process between client and supplier is important
Guidelines sandy coasts:	G[1]	The actor context is important. But each KTP demands its own interaction process organisation
COAST3D: The first objective of the project was to increase the knowledge of the morphology of the coast. And use it to improve present models of coastal behaviour. A secondary product of the project is the development of guidelines for the use of the developed products as CZM problem solving tools.	FR[1]	The context of use is important. Preferably the template is also applicable in an *ex ante* situation. In addition the template is only applicable when a genuine client with a question can be defined.

[1]: KTP: knowledge transfer process, AR: applied research; G: guideline-situation; FR: fundamental research.

2.2.3 Findings interpretation and improvement

The results of the application of the initial template (table 2.1) emphasised that KTP can be seen as a sequence of interactions between client and supplier and their environment, in which both parties learn. A final template needed to support a KTP (design, implementation, or evaluation) by making the realm of relevant context (actors, their interest and potential

influence on the question, and their interest in answer provided) explicit. A final template needed to focus on these three aspects:

1. the knowledge transaction itself by defining the type of knowledge transfer situation, the knowledge client and knowledge supplier, and their relevant characteristics;
2. the actor context in which the knowledge transaction takes place and how the knowledge will be used;
3. the (organisation of) communication between knowledge client, knowledge supplier, and other actors.

The final template for evaluation needed to consist of a set of assignments that forces its users to make these aspects of their KTP explicit, and thereby answer the question “are we doing the right things?”. The final template also needed to provide a set of normative principles to assess the quality of their KTP, i.e., to answer the question “are we doing things right?”.

Using these results and a combination of literature study, personal experience and discussions, the initial template was improved and tested on three cases and in a workshop (section 2.3).

2.3 Confirming the template

The final template of analysis was tested on four cases and evaluated in a workshop.

2.3.1 Testing with the cases

Four cases were treated with the growing and evolving template. The analyses themselves are given in Rozemeijer (2003):

1. The long term predictions of the morphology of the mouth of the Haringvliet
2. The impact of MV2 on the safety of Voorne and Goeree.
3. The guidelines
4. COAST3D

Case 1: morphology of the Haringvliet

Applying the final template of analysis on the first case demonstrated that it is important to see how the results are used in a political manner. At the moment of performing the research the case itself was clearly in a mode where goal-ambiguity is low and technical uncertainty somewhere between low and high. The amount of potential designs was limited. The results of the research showed that morphology was not a decisive criterion. During the time course, the political discussion continued: need and usefulness of MV2 were discussed repeatedly: goal ambiguity increased while knowledge was growing: a shift of decision making situation. This resulted in a repetition of the research using the methods developed but with each time changing designs.

Case 2 the impact of MV2 on the safety of Voorne and Goeree

The application of the final template showed clearly how the KTP was designed according to the need of the regional manager ("implementer", chapter 4) and that the interests of other stakeholders were integrated in such a manner that it suited the implementer best. The final template helped to become aware of this aspect because it urged to specify the interests of the different stakeholders and how those interests were represented.

Case 3: The guidelines

The guidelines situation represented a complex case in which it was really hard to understand who was who and why this actor was involved. The final template urged to address the specific roles of all actors and related to their interests also to their roles. By carefully assigning every actor his role, the complex interwoven structure of actors being clients, suppliers, quality controllers and end-users at the same time could be analysed.

In addition, this case also showed that the decision making mode has consequences for the type of knowledge needed by the supplier. The guidelines represent a decision making situation were technical certainty was high but goal ambiguity was low: a consensus had to be reached. The knowledge needed was not so much know what, why, when or how but more know-who. Who should be integrated in the process of consensus making on basis of jurisdiction or knowledge. The final template specifically addresses the point of sense making in the organisations involved. The application of the final template helped to realize that aspect.

Case 4: COAST3D

The analysis with the final template showed clearly that the template is only applicable when a genuine client with a question can be defined. In COAST3D, a client did not exist. Application of the template on this case of fundamental research also revealed that it is advisable to define a client if one of the intentions of the project is to translate fundamental results to more applicable tools. In such a situation the final template would also have great value as a guidance tool in an *ex ante* situation where the client should define his interests, working environment and needs.

Concluding: as compared to the initial template, the final template guided the analysts to a deeper analysis of the client environment and the actual use of the knowledge. The conclusions of the workshop (section 2.1.4) were being addressed. Overall a better comprehension and analysis of the cases was achieved.

2.3.2 The final workshop

The applications to the cases suggested that the final template was a powerful tool to analyse KTPs. It was decided to ask potential users how they experienced the final template for evaluation. There too a workshop was organised to verify the final template for its comprehensibility, usefulness and applicability. Clients, suppliers and mediators were invited. A role play (appendix D) was designed for a typical situation of knowledge transfer. In this role play the spill was two project co-ordinators with a minimum of information

available and a number of adjacent actors (experts and decision makers) who could only provide. information on request. Three consecutive rounds were defined equal with the current structure of the framework:

- Fill the first section of the framework together without the help of others
- Fill the second part of the final template for evaluation with the information of other actors
- Define a project set-up (also with the information of others)

Entering the workshop, participants were asked to write down some bottle-necks in KTP perceived in their own practice. Afterwards they were invite to write down what they had learned through participating in the workshop and applying the final template for evaluation.

Results

All participants were classified along the cline Client…Mediator…Supplier. Appendix E gives an overview of the problems perceived and lessons learned by applying the final template. The first thing that is noteworthy is that especially people with a mediator-type function had come. Analysing the table the major bottleneck in KTP seems to be the perception of the relevant context. Both mediators and suppliers mentioned this problem.

The final template was received well by the workshop. In general all participants thought that in its present state it is a good checklist in the end of an intake dialogue (*ex post* analysis of the intake but still an *ex ante* situation for the total course of the research). It makes a number of aspects of the KTP explicit and in this manner, reminds the client and supplier to discuss those aspects.

The opinions were divided whether the final template for evaluation should be converted to a more prescriptive design tool (*ex ante*). To achieve this, it would be advisable to change the order of the sections, eg the section on actor analysis could be placed as the first section. By this restructuring the final template for evaluation would fit more with the normal procedure of I) intake; ii) detailing and iii) projectorganisation. In addition, the questions could have a more open character. Another opinion was to leave the template as a checklist to be used in the end phase of the intake. A guideline would obstruct the use of common sense.

Everybody shared the opinion that the final template is of more interest to the public sector. Especially in this sector, stakeholder and actor environment is complex, something specifically addressed by the final template.

3 Conceptual framework for knowledge transfer

In this chapter we present a synthetic overview of concepts in terms of which we have come to understand knowledge transfer processes. The concepts are derived mostly from the literature on policy analysis, knowledge management and communication. In our selection and synthesis, we were guided by our experience in using the initial template for assessing the effectiveness of KTP. Thus, the synthesis in this chapter constitutes a conceptual model of KTP that we believe answers the following questions more clearly now:

1. Redefining the area of study: what do we view as KTP?
2. The product: how can knowledge be characterised?
3. Creation of knowledge: how is it made?
4. Policy and decision making and knowledge utilisation: what is needed?
5. Different actors and roles in the decision making cycle and their knowledge need.
6. Knowledge need and transfer in policy analysis activities.
7. Failures in the interaction between client and supplier.
8. How may KTP be improved?

Each of these questions will be elaborated in more detail in a separate section. The answers we have found have determined the template for ex post evaluation of a KTP that will be presented in Chapter 4 of this report.

3.1 Redefining the area of study: what do we view as KTP?

Matching research to the needs of knowledge clients is a complex problem. An inquiry into this matter could address a wide variety of aspects: substantive knowledge, research methodology, cognition, communication, learning, psychology, sociology, organisation, management, economics, politics, and more (Vlachos, 1978). Making a careful selection from this variety requires a conceptual frame that is at the same time generic and specific: it must be applicable to a wide spectrum of KTPs and yet offer sufficient resolution to detect and explain the relevant differences between these situations.

3.1.1 Reconsidering the focal area

In fig. 2.1 we have defined a focal area: the direct interaction between a policy maker and a researcher/consultant. This delineation is functional in limiting the amount of work but as it will appear is too much limiting for a complete evaluation of KTPs While reconsidering our initial template, we decided to refocus on the application area of our project – water management with an emphasis on coastal and river systems – and looked for specific literature on knowledge transfer in this area. The issue of knowledge transfer in water policy and management has been addressed explicitly as early as 1972 on the first International Conference on Water Resources Knowledge. On the second international conference, 6 years later, knowledge transfer is conceptualised in the following terms (Vlachos, 1978):

- knowledge transfer implies application of knowledge to a *new* use or user

- knowledge transfer implies a supplier and a user
- information must be tailored to user's needs (user-focus)
- the supplier-user relation does not necessarily have to be direct; the knowledge chain may involve numerous actors who maintain relations in a complex network

This conceptualisation is consistent with the model we introduced in section 2.2, but places more emphasis on the existence of a 'knowledge chain', rather than a single 'knowledge link' between policy maker and researcher/consultant. We are urged to increase the focal area in fig. 2.1 from the direct interaction between a policy maker and a researcher to the total extend of the field of knowledge making and the field of knowledge use.

3.1.2 Defining two entries in the fast focal area: client and supplier

Extending the focal area also urges to redefine the entries of this field. The terms researcher, user and policy maker are not suitable any more. Previous section showed that they can be anywhere in the two domains of fig. 2.1. The constant factor in such an elaborate field is still the direct interaction and communication between somebody who orders (buys) the knowledge and the person "handing it over" (selling). The following assumptions seem valid for this interaction (based on Vlachos, 1978):

1. Knowledge transfer implies a situation involving two parties and the existence of a 'knowledge gap' between them.
2. There is some kind of utility associated with the transfer of knowledge between these two parties.
3. The transfer of knowledge occurs in a process of communication.

These assumptions suggest that knowledge transfer situations can be understood through the metaphor of a 'market' (in the economic sense). Using the market metaphor, the user of the knowledge is defined as "client", the generator of knowledge is defined as "supplier". "Market failure' is due to imperfect information for one or both of the parties involved. If the knowledge supplier has no exact information on the demand for knowledge, or the knowledge client lacks information on what knowledge resides with (or can be produced by) which supplier, the knowledge exchange (if any exchange takes place at all) will not completely fill the 'knowledge gap'. There may be other causes for 'market failure' as well. When a knowledge monopoly exists (i.e., there is only one supplier), the supplier may refuse to invest in research and provide knowledge that is obsolete or unsuited for new problems the clients want to solve. When the 'knowledge market' is dominated by a rich and powerful client, the suppliers may develop knowledge that is tailored to this client's needs, while the knowledge demand of other, less influential clients is not met.

This study focuses mainly on the organisation of the communication (between knowledge client and knowledge supplier) of information on the client's knowledge demand and the suppliers' knowledge products, and on the transfer of the knowledge product from supplier to client.

Concluding

The knowledge transfer process is seen as a sequence of interactions between client and supplier and their environment, in which both parties learn. The template proposed in this

document is intended to support people involved in the design, implementation, or evaluation of a knowledge transfer process in making explicit and sharing this information, and in achieving the communication that is necessary for effective knowledge transfer.

3.1.3 Embedding the scales of use according to the knowledge chain

In Vlachos' conceptual model, the transfer process is seen to include the entire knowledge chain:

- generation of scientific knowledge (facts, concepts, theories, models and methods): the methodology should ensure that the generated knowledge is **valid**.
- communication from scientists to (potential) clients to ensure that the knowledge is transmitted but also to ensure that the new knowledge is **applicable** for the clients needs.
- adoption, i.e., the decision to implement and **apply** the knowledge
- diffusion, i.e., actual implementation and sustained use, making the knowledge part of social reality. The knowledge was tested, discussed and negotiated and appeared **effective** enough to adopt on a larger scale.

The four links in this chain strongly correlate with the four levels of knowledge transfer effectiveness we defined in section 2.2.2.

3.1.4 Transfer of knowledge trough the chain

But the client-supplier chain model as such says little about the way in which knowledge is transferred in this chain. Therefore, from the literature and his professional experience, Vlachos identifies four perspectives or 'schools of thought' on KTPs:

1. the *social interaction* perspective: knowledge transfer can be observed by measuring the process of communication in terms of the flow of messages, the number of adopters, the power and influence structures, and group membership; this is a social science perspective with no commitment to needs of users.
2. the *research & development and diffusion* perspective: knowledge is generated within the science and technology community in autonomous processes, and transferred from there by making generic knowledge products available for society – "wrap it nicely and assume someone will use it".
3. the *problem solving* perspective: knowledge is generated in user-oriented processes; messages about certain needs in society are acted upon by the science and technology community by transforming knowledge into self-perceived (i.e., by the suppliers, not the users) solutions.
4. the *linkage* perspective: knowledge transfer is part of larger problem solving process and part of development of reciprocating relationships between suppliers and users. Linkage is not simply a two-person interaction process, but an integral part of a chain of knowledge utilization, of a far-reaching problem-solving process, and of a more stable and long-lasting social influence network.

These perspectives show that there are different ways to study KTP. Observation of KTP from the social interaction perspective will provide information about the policy context and the positions and interactions of socio-political actors in this context. We shall elaborate this perspective mainly in section 3.2, but it will be relevant to all subsequent sections. The other

three perspectives seem to correlate remarkably with the three knowledge transfer situations described in section 2.2.4. The R&D and diffusion perspective fits to the research-driven situation, the problem solving perspective to the consulting situation, and the linkage perspective to the guideline situation. As each perspective emphasizes different aspects, we must ensure that they are properly integrated later on in this Chapter, when we propose ways for improving KTP.

The four perspectives also show a bias in Vlachos' use of the chain metaphor. Even though his basic KTP model emphasizes that knowledge transfer should be user-oriented, all four perspectives seem to be oriented in one direction: knowledge flows exclusively from supplier to user. Even in his rendering of the problem solving perspective, the 'demand side' of the knowledge chain seems quite passive: it is the supplier who picks up signals from the client. This is a needless restriction: a market with clients and suppliers can be of the produce-to-market type (dominated by 'technology push'), but also of the produce-to-order type (dominated by 'demand pull'). Throughout this chapter we must ensure that both types of KTP can be accommodated. Our KTP model should focus on the sequence of interactions between client and supplier and their environment, in which *both* parties learn and adapt.

3.1.5 Concluding on the area of study

Above section has helped us to redefine the focal area: KTPs (in Dutch watermanagement) are not just the single interaction between a user and a producer. It involves an entire chain of users and producers whom are all interrelated. To deny this aspect would lead to an incomplete assessment of KTPs. All actors are linked to other actors.

To address this complex field and links, we need entries and framing. The most direct entry is still the direct interaction between a researcher and a user but now considered in a market metaphor: the first being the supplier, the second being the client. The knowledge is a product but depending on the knowledge gap it can have different properties. All together, the starting points in Chapter 2 are still valid but is detailed and will be detailed more in the next sections.

3.2 The product: how can knowledge be characterised?

3.2.1 The product: characterising types of knowledge needed and transferred

Vlachos does not specifically address the type of knowledge that is transferred in a KTP. Yet different types of knowledge may ask for different KTP. Lundvall and Johnson (1994) and Johnson and Lundvall (2001) give a characterisation of different knowledge types:

- *Know-what* refers to facts like the annual river discharge or daily height of the tide. It yields the data that can be used to infer 'know-why' knowledge.
- *Know-why* refers to knowledge of principles and laws of functioning. Knowing why the tide has its height makes it possible to make a prediction model. Fundamental research typically aims to infer 'know-why' knowledge from 'know-what' knowledge.
- *Know-how* refers to the ability to do something. It is related to skills and experience. Knowing how to maintain the Dutch coastline with a highly cost-efficient sand

suppletion methodology requires professional engineering skills. Designing complex mathematical models is another example of 'know-how'. Van Koningsveld (2003) distinguishes a special form of know-how: *know-when*, referring to the ability to adequately judge when to use particular knowledge.

- *Know-who* is a form of meta-knowledge and used to combine different forms of knowledge. The current trend towards integrated water management and more comprehensive policymaking requires complex interdisciplinary problem solving. Therefore, it is important to know who knows what and who knows what to do. In a policy context, this also means knowing who is stakeholder and with what interests and what power. 'Know-who' knowledge is also skill-related: one must be able and appreciate to communicate with others.

These four types of knowledge help us to diagnose the 'knowledge gap' between client and supplier. The list gives a first characterisation of the arrow of transfer in fig. 2.1.

3.2.2 Detailing the knowledge gap

Van Koningsveld (2003) characterises this knowledge gap in terms of three dimensions: the knowledge required by the client, the present knowledge state of the client and the knowledge state of the supplier. Each dimension has a two-point scale: policy problem and the knowledge requirements it generates can be either simple or complex, and the client and the supplier can either already possess this knowledge or still lack it. The resulting model (see Figure 3.1) allows us to broadly characterise a knowledge gap and subsequently relate it to a type of knowledge transfer.

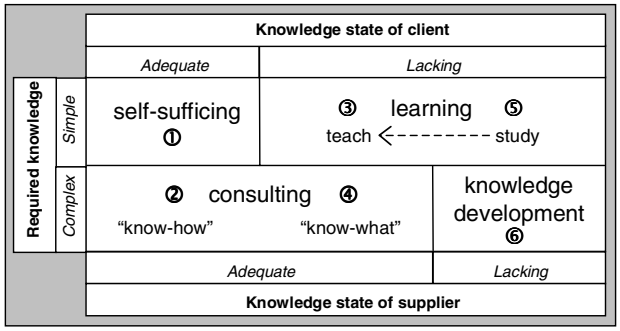


Figure 3.1. Characterisation of knowledge gaps

If the client possesses the required knowledge, there may be ① no need for knowledge transfer from supplier to client, or ② the client may not know *how* to process (e.g., collect, structure, select, combine, deduce, apply) this knowledge. If neither the client nor the supplier possesses sufficient knowledge, simple knowledge can be first ⑤ acquired by the supplier (knowledge acquisition through purposive studies) and then ③ transferred ('taught') to the client, while complex knowledge may call for ⑥ joint knowledge development. In the more likely situation that the supplier has knowledge that the client is lacking, this knowledge may be ③ simple, in which case the client can acquire this knowledge for immediate and future use (the client's knowledge level becomes adequate), or ④ complex, in which case the supplier assists the client with knowledge to perform the complex task at hand and the client will need such assistance again in the future (the client's knowledge level remains limited).

The characterisation given also helps us to diagnose the 'knowledge gap' between client and supplier.

3.3 Creation of knowledge: how is it made

Producing knowledge starts from the point of having knowledge. An organisation possesses three types of knowledge (Choo, 1998):

1. tacit knowledge (know-how, -when -why and -who, expertise, experience, intuition) in the employees (to a large extent the process and anarchistic model of decision making in Figure 3.2, to a minor extent the political model);
2. explicit rule based knowledge codified in organisational rules (rational model in Figure 3.2);
3. cultural knowledge: expressed in assumptions, attitudes, believes and norms (company culture, O'Blair et al., 2000) used by members to give value and significance to new information or knowledge (Choo, 1998).

Using those three type of knowledge, three models of knowledge generation are defined (Choo, 1998):

Knowledge conversion (Nonaka & Takeuchi, 1995): in four steps the process is:

1) tacit knowledge in individuals is discussed, combined and synthesized to new knowledge.
2) This new knowledge is made explicit (discussed) in concepts
3) Which are evaluated with the explicit knowledge and culture of the organisation.
4) When concepts are tested, elaborated and accepted, they are integrated into the explicit knowledge of the organisation.

Knowledge building (Leonard-Barton, 1995): here the generation of knowledge is described in four dimensions and four activities. The four interdependent dimensions are:

1. skills and [tacit] knowledge of the employees
2. physical and technical equipment and datasystems
3. managerial systems stimulating innovation like education, reward and incentive systems
4. values and norms that determine which knowledge is sought

The four activities are

1. shared, creative problem solving
2. implementing and integrating new methodologies,
3. experimenting and prototyping
4. importing knowledge from outside

Comparing Leonard-Barton to Nonaka & Takeuchi makes clear that in principle both approaches are similar (see also Choo, 1998). Both approaches emphasis the conversion of tacit knowledge in individuals into explicit concepts which can be discussed. The new concepts are evaluated. However, Leonard-Barton also looks at the importance of the outside world as an inspiring, validating and judging environment. In fact she states that new products and service concepts (or knowledge) should be based on a deep emphatic understanding of unarticulated user needs.

Knowledge linking (Badaracco, 1991): an organisation can obtain new knowledge by importing know-why, know-how and know-when from other companies. In order to be able so it should have know-who. In addition overcoming inter-(company)cultural differences is an important aspect. Usually such a transfer of knowledge has mutual beneficial aspects

3.3.1 Concluding on how knowledge is created

In essence, knowledge is a product quite unlike other transferable goods and its production is an unpredictable process that is difficult to control.

The three models of knowledge generation have great resemblance with the decision-making cycle (DMC) (problem definition, solution definition, evaluation and deciding, see next section). However they have some specific common characteristics as compared to the DMC. They have great similarity in the three steps: 1) generating new ideas (divergence); 2) elaborating, detailing, conceptualisation; and 3) a situation of converge: evaluation on the basis of culture and needs, accepting and integrating the new ideas in existing procedures. The difference with the abstract DMC is the emphasis on two things. Firstly, emphasis is put on the personal aspect of tacit knowledge within the individual. Not all knowledge will be made explicit (Choo, 1998). This aspect seems unsurpassable. How can one always transfer tacit knowledge in explicit knowledge. One could even wonder if it is economically wise (Johnson & Lundvall, 2001).

The second aspect is the emphasis on the sense making in an organisation. The situations we mostly focus on (knowledge provided by specialists for a public organisation in watermanagement) are described (analysable) by the knowledge building model (Leonard-Barton, 1995) in general and more specifically and appropriate by the knowledge-linking model (Badaracco, 1991). Leonard-Barton (1995) stresses the importance that the supplier should be aware of the client's needs. We have translated that awareness of needs to an awareness of the context of and use by the client as generated by applying our template. Leonard-Barton (1995) also urges that during the generation of new knowledge, the (half-) products should be confronted regularly with the needs of the demanding organisation to ensure applicability, application and effectiveness. The new knowledge should by tested against official decision rules but also against the unofficial client culture and the policy paradigm he uses: sense making (Badaracco, 1991, Choo, 1998, Stone et al., 2001). The degree of assimilation of the new knowledge into the client's organisation is influenced by the range, diversity, depth and exchange of the existing knowledge in the organisation (Choo, 1998). These observations imply organisational demands on the actual KTP (asking a knowledge product) to a supplier. This is reflected in a special section in the final template dealing with this issue. This sense making by the organisation of the client, however, seems like a very important aspect that is acknowledged in literature, but usually not recognised and acknowledged by clients and suppliers in the field.

3.4 Policy and decision making and knowledge utilisation

As water management is a public issue, the locus of our research into the effectiveness of KTP is public policy making. This means that, to obtain a useful KTP model, we must draw strongly from the literature on public policy and decision making, while the bulk of the recent literature on knowledge management is focused on organisational processes in

industry. Looking at policy and decision making, it will be described where knowledge is used and how. We will show that each player in the field has his own demands on knowledge and that this will have consequences for the KTP. Decision making can be framed in four layers (spectrum 3.1), that will be detailed below:

1. the process of policy/decision making,
2. the actors and their roles in that process,
3. the (type of) activities these actors undertake
4. Organisational level of focus

Spectrum 3.1: Full spectrum of decision making

[Decision making]	Problem-definition	[environmental impact]
[Implementation]	Solution-definition	[monitoring]
[Evaluation]		
(Decision making cycle)		
Politics		**Science**
ratifier ..… selector … nominator …	policy analyst …	expert … scientist
[…..policy maker]		
Democratise	Clarify values	Research and analyse
	Mediate	
	Design and recommend	
[Strategic advise]		
Institutional	**Stakeholder processes**	**natural system**

Aspect in different rows but at the same height of the spectrum are linked to each other

3.4.1 Decision making cycle

A decision making cycle (DMC) offers a framework, based upon the policy cycle for coastal and marine management problems, which has been developed in various management oriented studies in the past. Ignoring reality and daily practice of politics (but useful for framing at this stage), the following phases and key issues can be identified:

Diagnosis, focusing on problem recognition
Planning and analysis, focusing on development of remedial measures and strategies
Implementation, with the emphasis on management and engineering interventions
Monitoring and control, focusing on monitoring and evaluation

3.4.2 Detailing the DMC and linking it to knowledge needs

Reality is more complex than the simple schedule above. Choo (1998) presented a conceptual framework that encompasses four models of organisational decision making. A similar framework that focuses on for public policy is presented by Dunn (1981), but the advantage of Choo's work is that it focuses on the knowledge aspect.

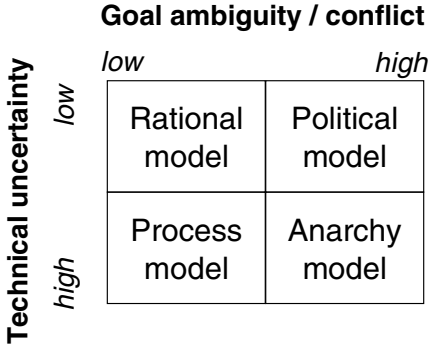


Figure 3.2. Models of decision making (Choo 1998)

This model (see Figure 3.2) has two dimensions: *goal ambiguity/conflict* and *technical uncertainty*. Each dimension is scaled on a low/high range, resulting in a 2×2 matrix. Each quadrant in this matrix corresponds to a particular mode of decision-making:

1. The *rational* model of decision-making reflects the paradigm of bounded rationality. This paradigm assumes that the decision-making process is strongly goal-directed and based on long-term experience and knowledge which has been codified in performance programs and standard operating rules. The knowledge need in such a situation is performance indication. It is assessed by evaluating the results with past performance, experience and comparison with other comparable organisations. It is typical 'know-how' and 'know-when' knowledge that leads to minor adaptations of the existing models of operation. Thus, the rational model implies a certain conservatism (see also Geldof, 2001).
2. The *process* model views decision-making as a process that proceeds in three fairly distinct phases: identification, development and selection. In the first phase, the problem is acknowledged and defined, then a number of alternative solutions are developed, which are subsequently evaluated, leading to the selection of a final solution. Each of the three phases typically involves multiple iterations. This view fits to situations where the goals are strategic and clear, but the technical methods to attain them are uncertain. The knowledge need in the initial phase of problem finding and problem definition typically is 'know-what' knowledge. When moving into the development phase, the knowledge need shifts towards the 'know-how' type of knowledge, while in the selection phase, 'know-why' knowledge is needed to predict the effects on goal variables in order to justify the option that is eventually selected.
3. The *political* model corresponds to a negotiation and bargaining view on decision-making. The various potential technical solutions are clear but the goals are contested by various interest groups. The decision-making process proceeds more like a series of rounds in what may be seen as a game in which each player strives to maximise his own goal attainment. To be effective in this 'game' of negotiation and bargaining, it is important to know who is involved, who has what interests and which means of influence, who takes which position, and how are the groups interrelated. This 'know-who' knowledge is therefore most relevant.
4. The *anarchistic* model reflects a 'garbage can' view of decision-making. It is most suitable for situations in which both goals and technical solutions are highly uncertain. Problems, solutions, and stakeholders each have their own timing and schedule, and actual decision-making occurs only when – more or less accidentally – all these three aspects come together and open a 'window of opportunity' (Kingdon, 1984). The

knowledge need in such a situation can be of any type; perhaps one could even better say that there is no articulated knowledge need, but a search for opportunities.

Choo's classification suggests that when designing KTP, one should investigate which type of decision-making process is most appropriate for a given situation. His model shows that different situations call for different types of decision-making processes. Choo translates this insight directly to knowledge transfer, but this translation provides limited resolution for analysis within each of the four quadrants of Figure 3.2. Since policy analysis is the discipline that traditionally aims at providing knowledge to policy makers, we shall investigate the design considerations for policy analysis studies later on.

3.4.3 Use of knowledge in policy processes

Stone et al. (2001) described four models of knowledge utilisation that also have close resemblance to the four modes of decision making in Figure 3.2.

1. The rational model

The central principle is that scientists and experts collect and analysis all data available. In this manner all policy options are presented. The knowledge provides policymakers with all certainty possible for that moment. The policy and decision making is problem solving orientated. In this sense it belongs to the left side of the schema in Figure 3.2: goal uncertainty is low. In this model knowledge is 'neutral'. It also assumes that decision makers will be persuaded to choose for the most accurate or scientifically plausible option. The noise in communication in this model is that it operates from a unrealistic view on reality. Both poor predictive capacity of (social) science in addition with a tendency to satisfy immediate public needs rather than maximise long-term social gains result often in less complete overview of alternatives (Stone et al., 2001). Supplier and client have to accept hat the amount of information available will never be satisfying the idealistic world view.

2. Muddling through

The starting point from this model is the boundary between rational and non-rational aspect of (human) social behaviour. Decision-makers tend to choose a satisfying solution in the face of competing demands rather than to try to maximise organisational goals. This model can belong to the right side of the schema in Fig. 3.2: goal uncertainty (competing demands) can be high. The model is called "muddling through' because it assumes that decision makers are focused on satisfying current needs and tend to behave conservatively. New knowledge is hardly generated. Only when pressure groups or crises arise new knowledge is asked for (Stone et al., 2001).

3. The knowledge utilisation school

In this model knowledge grows through accumulation. Subsequently this knowledge becomes incorporated into practice, in a process termed 'enlightenment'. While single research results are rarely convincing enough, accumulated results gradually alter the perceptions of the decision makers (Stone et al., 2001). The latter resembles the sense

making process of new knowledge provided to organisations as described by Choo (1998) and the cultural acceptance as described by Badaracco (1991). Both the direction of knowledge generation and changes in policy influence each other mutually but also develop independently.

The noise in knowledge transfer and its communication is that this school assumes also that knowledge is neutral and apolitical. It neglects the fact that knowledge can be used in a social or political context.

4. Policy paradigms

Policy paradigms give the most complete view on knowledge use. A 'policy paradigm' is "an overarching framework of ideas that structures policy making in a particular field" (Hall, 1990). It is the combination of cultural knowledge, beliefs and preferences that all participants (scientists, decision makers etc.) have as a framework of reference (Choo, 1998, Stone et al., 2001). "The [policy] paradigm serves to define the problems that are to be addressed.". "In this approach socio-economic and political factors become the main determinants of whether knowledge is acceptable" (Stone et al., 2001). In this sense the process of decision making is always on the right side of fig. 3.1. Goals need to be evaluated each time and new knowledge is used as a mirror and potential inspirator.

The policy paradigm has a certain conservatism and alternative policy paradigms will only be sought when there are either increasing policy failures or political problems. It is important to realize that politicians will choose that knowledge which will either advocate their point of view or challenge the point of view of their opponents. Here a large point of noise in knowledge transfer is pointed out: the client determines from his own agenda whether the new knowledge is accepted/used or not. The supplier can probably increase the effectiveness by taking this political use into concern.

Three different orders of knowledge acceptance and use have been defined within the framework of policy paradigm (Stone et al., 2001, Hall, 1990):

1. *First order changes*: these concern minor changes on the existing policy paradigm. The legitimacy of the paradigm is not question. The new knowledge should focus on what it is adding the existing situation (described the context).
2. *Second order changes*: The basics and concepts of the existing policy paradigm are not questioned but methods of implementation are. This usually occurs when the implementation of the policy fails to satisfy the societal need. Through limited experimentation and evaluative research new approaches can be generated. The new knowledge should clearly demonstrate its effectiveness and applicability in achieving the aims. However, this type of knowledge also seems very susceptible to the political process: here especially the supplier should take note of the political use.
3. *Third order changes*: when first and second order changes cannot satisfy organizational needs, a new paradigm can be defined: problems are redefined, new interpretative frameworks are developed and policy learning from external sources takes place (Stone et al., 2001, Mayer et al., 2002). Changing views on Dutch water management are an example of such a policy paradigm (Veltman et al., 2000, Mayer et al., 2002). In these situations goal uncertainty is high (fig 3.1) and the knowledge supplier should take into account that his new knowledge is just a piece of information in a major process of

evaluation.

3.4.4 Concluding on knowledge use

All together the most important finding on knowledge use is the fact that the client will use the results in manner that suits the client. Policy processes are unstructured and highly political, involving a multitude of different actors, which makes the use of knowledge unpredictable and difficult to control. This view is confirmed by the findings of Peters (1996) and Lomas (2000) who also suggested that policies and decision making are based on a contest over values and an open debate rather than on facts and knowledge. Lomas also showed an example from literature where the same results were used to support opposing opinions demonstrating how context determines the applicability of knowledge. Knowledge was used in a political manner. Also Landry et al. (1998) draw a similar conclusion that the dynamics of the context in which the new knowledge will be used is the most important factor that determine the use the findings of social science research in Canada. Again we are urge top consider KTP in its entire chain and thereby extend our scope.

3.5 Different actors and roles in the DMC and their knowledge need

Knowledge transfer implies an exchange between two or more actors. In the previous section, we have seen public policy typically involves a variety of actors in dynamic interaction. An analysis of the type of actors commonly encountered in a policy context may give more insight in the types of knowledge and type of KTP in this context. Actors can be analysed by using certain predefined categories of the roles that actors can play in knowledge transfer and policy development (including policy preparation and implementation). The detailed classification made by Goeller (1988) provides a rich picture of possible roles. His two main categories make a distinction between roles related to the problem situation, and roles related to the analysis. They required only slight adaptation to fit our distinction between the client context and the supplier context.

3.5.1 Role types in client context

Policymaker

Throughout this report, the client in KTP in the area of water policy and management usually is the ***policymaker***. In this role, an actor can establish or modify policies (and programs), which, through implementation, affect problem situations. As this role type is very generic, three sub-types are commonly distinguished:

- ***The nominator*** recommends a particular option, or presents a short list with several promising options (for example, the civil servants in the advisory staff of a Ministry). The nominator therefore requires knowledge of possible options and their properties, and knowledge of policy objectives, which s/he then combines to screen the options and present a motivated shortlist.

- ***The selector*** chooses the preferred option, but not necessarily from those offered by the nominator (for example, the Minister or the Cabinet). This means that the selector will draw from other sources of knowledge as well.
- ***The ratifier*** may veto, approve, or modify the selector's choice (for example, the Parliament). The ratifier typically requires knowledge of the preferences of his constituency, so that s/he can justify his decision when challenged. Although the ratifier may trust the nominator and selector to do their jobs properly, s/he will have to be sufficiently knowledgeable about the proposed policy option to judge whether its implementation is indeed warranted.

Implementer

Where the policymaker decides on the policy, ***the implementer*** attempts to execute the policy chosen by the policymaker. This requires adapting the general policy to make it more practical, to resolve open issues, and to accommodate new political concerns. For this role type, three sub-roles can be defined:

- ***The installer*** creates the facilities or assembles the resources necessary to get the policy into operation (for example, contractors who build new dams or other works). The installer therefore requires detailed knowledge about these facilities and resources; their functional specifications must be provided by the policymaker. The installer will act upon these specifications while using (possibly after acquiring) specialist knowledge about the facilities and resources involved.
- ***The operator*** is responsible for the day-to-day operation of the implemented policy (for example, those who control the ground water level in a region). The operator requires detailed knowledge of the objectives and instruments defined by the policy, and professional means-ends knowledge.
- ***The implementation manager*** develops guidelines, prepares plans, administers contracts etcetera, and may select and manage the installers and operators or perform some of their functions (in the Dutch context, for example, Rijkswaterstaat frequently acts as implementation manager). Implementation managers require knowledge of the policy to be implemented, detailed knowledge of the characteristics of the organisations that (can) act as installers and operators, and detailed knowledge of the implementation process (coordination mechanisms, progress, potential problems).

Stakeholder

Although policymaker and implementer both have a strong interest ('hold a stake') in the policy process and its outcome, the role type ***stakeholder*** commonly refers to those directly affected by the policy (for example, those threatened by floods), or indirectly affected (for example, future generations or workers in indirectly related industries, such as concrete production for building water works). Stakeholders require knowledge of the issues that emerge in their environment, as well as knowledge enabling them to assess whether these emergent issues may pose an opportunity or threat. Issues may emerge because a stakeholder sees (a potential solution to) one of his/her own problems, or because (a possible solution to) a problem of some other stakeholder may affect his/her interests.

The lobbyist seeks to influence policy makers toward a particular viewpoint. Lobbyists may be persons affected by the problem situation, or persons outside the immediate scope

who are merely concerned with the problem situation (for example, a local chamber of commerce). Lobbyists require knowledge of the interests of the stakeholders on whose behalf they are acting, and – more importantly – knowledge of the actor network and the position and power of individual policy makers in this network, and knowledge of the policy process (both past and planned events).

The evaluator compares the actual effects on the problem situation with the expected effects after the implementation of a policy or program. In addition to knowledge of the implemented policy and its intended effects, evaluators require substantive knowledge of the policy area that will allow him/her to assess causal relations between policy and outcomes, and knowledge of what constitutes an appropriate evaluation procedure in view of the policy context, the actors and their interests.

The enforcer is an evaluator who has the power to enforce policy changes if s/he observes that an implemented policy performs unacceptably. This requires knowledge of the norms that define the line between acceptable and unacceptable performance.

The advisor/analyst supplies information, conducts analyses, recommends action, suggests political strategy, or provides emotional support. Analysts are usually involved in knowledge transfer as advisors, the main difference between analysts and other advisors being the degree to which their recommendations are neutral and transparent. As 'knowledge processors', the knowledge input and knowledge output of advisors and analysts will vary, depending on their clients' need.

The implementation planner performs analysis specifically to assist implementation planning or other decision making by implementers. Although Goeller associates this role with the analysis, rather than the problem area, we see this role to belong to the client context, as it is so closely linked with the implementers and the required knowledge is procedural, rather than substantive.

For clarity sake, the first row of spectrum 3.1 only shows the policymakers and not the implementers. They will have a similar spectrum parallel to that of the decision makers, as is also suggested by placing implementation at the same height as decision making (spectrum 3.1). The stakeholders are represented in the fourth row. For clarity sake they are not detailed either.

3.5.2 Role types in the supplier context

The supplier in KTP in the area of water policy and management usually is a group of professional researchers and/or consultants that is asked to perform one or several policy analysis activities. Goeller (1988) identifies the following roles that are related specifically to these analysis activities.

The role that establishes the immediate and most obvious link between the client context and the supplier context is that of ***problem poser***. The problem poser defines the problem and the knowledge that is to be provided by the analysis team. It can be disputed whether the problem poser should be seen as part of the client context or as part of the supplier context, as the problem poser role may be fulfilled by an individual who also has the role of policymaker. The problem poser role is characterised by this very crucial knowledge requirement: s/he must know what knowledge is needed by the client and what knowledge can be supplied when time and other constraints imposed by the policy context are considered.

Another role that links the client context with the supplier context is ***the sponsor***. The sponsor commissions the work and sees to its support. The sponsor commonly selects the

research organisation to perform the analysis, determines the funding level and may influence staffing. S/he also participates in problem definition and reviews progress and findings. This suggests that the sponsor role may also combine well with the role of policymaker, in particular that of selector or ratifier, since the actors in these roles usually command the resources available for research. Sponsors require knowledge of the policy problem, the characteristics of research organisations that may contribute useful knowledge, the resources available for knowledge acquisition, and the expected added value of knowledge, i.e., an estimate of the benefits due to improved policy making.

The analysis team designs, plans, performs and documents the study. The team requires knowledge of what results the analysis should produce. The analysis team members should have expert knowledge in their respective fields, but will require case-specific knowledge (e.g., datasets to calibrate hydraulic models for a specific coastal zone). More in particular, the *project leader* of the analysis team will require knowledge of the problem as defined by the problem poser and of the constraints on resources as defined by the sponsor.

When multiple analysis projects are underway in an organisation, similar projects are often organised as a research program, managed by ***a research program director***. The program director usually selects a project leader, helps negotiate the research agenda with the sponsor, and reviews progress and findings. S/he may allocate resources among competing projects and determine which prospective projects will start. The strategic plan for the program reflects such goals as building intellectual capital for the analysts, promoting synergy among projects, developing a centre of expertise, and creating a foundation for growth into new areas. A research program director requires knowledge of the research projects (past, ongoing and planned) within his/her organisation and preferably also of relevant projects in other research organisations. Moreover, s/he requires knowledge of the qualities of individual researchers and teams, the results that may be expected, and the sponsor's priorities. S/he will also require knowledge about developments in policy arenas to anticipate on future research projects.

In addition to these major roles in the supplier context, Goeller identifies three lesser roles that merit consideration.

The *advisor on the analysis* provides guidance to the analysis team in designing and conducting analysis. Advisors are often formal advisory groups, called study advisory group or steering committee (to guide on the scope and emphasis of the research), or technical advisory group (to provide data and expertise on concrete and specialised aspects of the problem).

The formal reviewer reviews both the analysis process and its outcomes and judges their quality. The formal reviewer should be an expert on research and analysis approaches in general. To perform his/her role, the formal reviewer requires knowledge of the standards that are commonly accepted within the disciplinary domain for which knowledge is generated, and be aware of the state of the art of research in this domain.

Tailoring above roles to a more aggregated approach fitting better our DMC and spectrum we get the ***scientist*** (specialist in a limited expertise), ***expert*** (top scientist with ample experience, being able to position his expertise in a broader field) and ***the policy analyst***: a specialist who has ample insight in the process and needs of both policy making and science generation. These roles are integrated in spectrum 3.1.

The most generic role that Goeller relates to the analysis is the role of ***user***. The *user* makes use of the study findings while performing a specific task. Users establish a strong link

between the client context and the supplier context, as they can have any role (policymaker, implementer, stakeholder, lobbyist, evaluator, enforcer, advisor/analyst) in the client context.

3.5.3 Concluding actors and roles

The crude identification of the generic knowledge need of each of these actor role types demonstrates how important it is to specify explicitly for a KTP who is viewed as the client and who as the supplier, and, moreover, what other actor roles are involved. Above section make the different roles available. It also urges a analyst, supplier or client to review his role and the KTP in a broader context of use (knowledge chain). The role types identified here can also be used as a frame of reference (a 'checklist') to scan the KTP context for relevant actors. Each actor will have a different knowledge need depending on the position they have in the chain of decision making. But care should be taken because the role types are not bound to a single direction of the knowledge flow. Each role is effectively a 'Janus head': each role can be a client with a particular knowledge need, but also a supplier of specific knowledge.

3.6 Knowledge need and transfer in policy analysis activities

When looking for KTP in public policy, it makes sense to address the question: "What general activities do policy analysts perform when it comes to supporting policy and policy processes?", as the answer to this question Mayer *et al.* (2001) define a conceptual model that features six major clusters of activities:

1. *Research & analyse*: This activity cluster matches quite well with a perspective on policy analysis functioning in a rational model. The cluster is characterised by the use of research methods and techniques that are scientific or derived from science, such as data collection techniques, mathematical modelling, and statistical analysis.
2. *Design & recommend*: When sufficient data and information have been gathered in earlier research, a policy analysis will focus on translating the available knowledge into new policy, either by making recommendations or by making a complete policy design. Recommendations will typically be the result of comparing the effects of different policy alternatives and weighing the options based on various criteria. A complete policy design typically involves generating a set of alternative strategies that each consists of several tactics aimed at achieving particular objectives or sub-goals.
3. *Provide strategic advice*: Policy analysis will often be a strategic activity. The substantive or procedural advice will be made dependent on the analysis of the field of forces that exist, i.e. the environment in which the client and his problem are located. The policy analyst will advise the client on the most effective strategy for achieving certain goals given a certain political constellation, i.e. the nature of the environment in which the client operates, the likely counter-steps of opponents, and so on.
4. *Clarify arguments & values*: Policy analysis may not only make instrumental recommendations for policy-making; it may also analyse the values and argumentation systems that underpin social and political debate. Moreover, policy analysis seeks to improve the quality of debate by identifying the one-sided or limited nature of arguments or showing where blind spots exist in the debate.
5. *Democratise*: In the democratise cluster of activities, policy analysis does not have a value-free orientation, but a normative and ethical objective: it should further equal access to, and influence on, the policy process for all stakeholders. Experts and elites are

more likely to be involved and carry greater weight than ordinary citizens and laymen. Policy analysis can try to correct this inequality by calling for attention to views and opinions typically overlooked in policymaking and decision making.

6. *Mediate*: In particular in situations with high goal uncertainty or goal conflict, resolving policy issues may require mediation. Policy analysts can play a role as process designer or process supervisor. In this role, the policy analyst designs the rules and procedures for negotiating in a policymaking or decision making process and manages the interaction and progress of that process. The mediation cluster comprises different types of activities, with a focus on analysing contextual factors (stakeholders, issues, dependencies, tensions, tradeoffs), and designing, and possibly also facilitating, meetings in which different stakeholders and decision makers consult and negotiate. The policy analyst mediates during the design of the negotiation process as well as its execution.

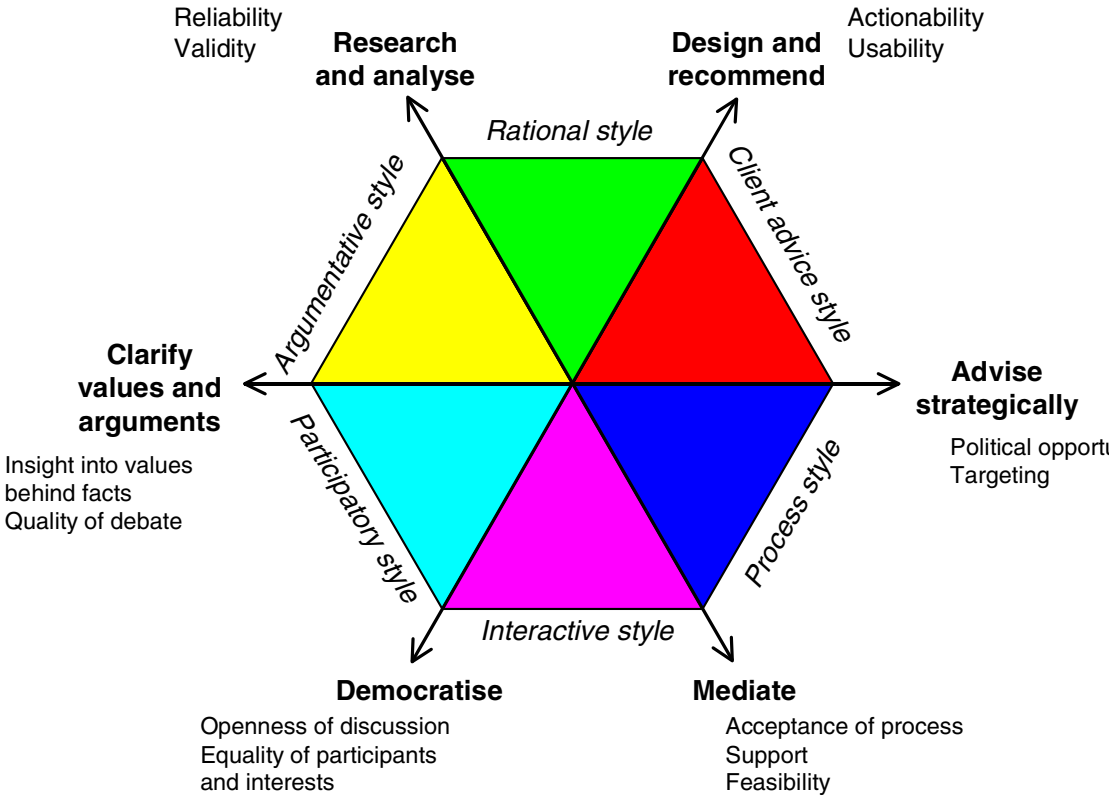


Figure 3.3. Policy analysis activities and associated values

The hexagon in Figure 3.3 is a diagrammatic representation of these six activities. In real-life cases and projects, a policy analyst will combine one or more activities, albeit not all at the same time. The styles, discussed at length by Mayer *et al.* (2002), refer to the combination of the two adjacent activities. For each policy analysis activity, the associated values are identified, which determine the criteria by which specific occurrences of the activity will be judged. In the following paragraphs, these criteria are elaborated in more detail from a knowledge transfer perspective.

1. *Research & analyse*: This type of policy analysis will be judged by substantive (scientific) quality criteria such as validity and reliability, the use and integration of state-of-the-art knowledge, the quality of data gathering and the formal argumentation

and validation of conclusions. These values reflect those of the community of scientific researchers and analysts, and indeed in research and analyse activities, knowledge transfer takes place mainly between researchers and analysts. The values coincide with the first level (scientific soundness) of our initial model for KTP effectiveness (cf. section 2.2.2). In our initial set of evaluation criteria (cf. section 2.2.5), the criteria for good research and analysis are those specified in categories 2 through 8 in the first table in appendix A.

2. *Design & recommend*: Policy analysis will be judged by instrumental criteria of policy relevance, such as usability and accessibility for policymakers, action orientation and utilization, presentation and communication of advice, weighing up of alternatives, clear choices and so on. These values are bound to the knowledge transfer from researchers to policy makers. This is by eminence the case in the consulting situation as defined in section 2.2.4, and strongly relates to the second level (policy relevance or applicability of the transferred knowledge) of our initial model for KTP effectiveness. In our initial set of evaluation criteria (cf. section 2.2.5), the criteria for good design and recommendation are those specified in category 9 in the first, and categories 1(a) through 1(d) in the second table in appendix A.
3. *Clarify values& arguments*: Policy analysis will be judged by quality of argumentation and debate criteria such as formal logic (consistency), informal logic (rhetoric and sophism) and quality of the debate in terms such as richness, layering, and openness of arguments. The clarification of values and arguments is clearly relevant to knowledge transfer in policy processes, but it is easily overlooked. In a context with high goal uncertainty, both the consistency and the richness of the goals that emerge in this process are bound to affect the effectiveness of knowledge transfer in the research, analyse, design and recommend activities. In our initial model for KTP effectiveness, there are no explicit criteria that reflect this.
4. *Advise strategically*: Policy analysis will be judged by pragmatic and political effectiveness criteria such as the 'workability' of advice, political cleverness and proactive thinking, greater insight (for the client) in the complex environments (political and strategic dynamics, forces and powers), targeting and achievement of goals. Like design and recommend, the strategic advice activities are closely tied to the consulting situation, and the usefulness of the advice (here the applicability of the largely political knowledge that is transferred) is the main criterion. But unlike the substantive designs and recommendations, strategic advice is not evaluated by any of the criteria in appendix A.
5. *Democratise*: Policy analysis will be judged by democratic legitimacy criteria such as openness and transparency of the policymaking process, representation and equality of participants and interests, absence of manipulation and so on. When focusing on knowledge transfer, the activities in this cluster should distribute substantive knowledge more evenly over the actors involved in the policy process. Knowledge transfer is effective if it provides equal access for all stakeholders to relevant knowledge. This criterion can be applied in any of the three situations (consulting situation, guideline situation, and research-driven situation) in section 2.2.4, provided that there are no restrictions to who can be the client. But in our initial model for KTP effectiveness, there are no explicit criteria that reflect this.
6. *Mediate*: Policy analysis will be judged by external acceptance and learning criteria such as the agreement that mutually independent actors reach on the process and/or content, support for and commitment to the negotiating process and solutions, learning about other problem perceptions and solutions. The knowledge transferred in these

situations is a mixture of substantive knowledge (what are the issues, what are causes, and what policy options are available?) and process knowledge (who are stakeholder, what are their interests, who wields what power, and where is room for negotiation?), and the distinction between clients and suppliers is often difficult to make. Again, our initial model for KTP effectiveness did not address this type of knowledge transfer, which is nonetheless quite important in policy situations.

By looking upon each of the six policy analysis activity clusters from a knowledge transfer perspective, we have discovered that each type of activity involves a very different type of knowledge transfer. Moreover, we find a strong bias of our initial model of KTP effectiveness to research, analyse, design and recommendation activities. Criteria for judging the effectiveness of knowledge transfer in situations that involve activities from the other clusters are missing and it seems worthwhile to investigate the types of knowledge transfer involved.

3.6.1 Conclusion on actor activities

KTP in the context of public policy are complex processes. The four types of policy contexts as characterised by Dunn (1981) and linked to the knowledge aspect by Choo (1998) relate to the six types of policy analysis activities as identified by Mayer *et al.* (2002), but this relationship clearly is not one-to-one. Although clarification of values and arguments, democratisation and mediation would seem be strongly linked to situations with high goal uncertainty, and research and analysis, design and recommendation, and strategic advice strongly linked to situations with high technical uncertainty, one can easily conceive a situation where scientific research or innovative policy options cause a change in goals Moreover, decision-making processes are not confined to a single quadrant in Figure 3.2. Thus, they will always involve a mixture of several activities. Purposefully choosing and configuring policy analysis activities to fit to the policy situation as it evolves over time is an important instrument for process management. Principles for process design and process management are likely to be valuable to improve KTP in a policy context.

3.7 Failures in the interaction between client and supplier

Vlachos (1978) considers communication to be of key importance (Section 3.1.2), and introduces the Source-Message-Channel-Receiver model (SMCR, Berlo, 1960) and the notion of ‘noise’ (cf. Figure 3.4) as a useful way to address the quality of communication as a crucial factor in the transfer of knowledge. In this section, we pursue the line set out by Vlachos to further conceptualise the failure factors in KTP.

Vlachos identifies four types of noise that may hamper the dynamic process between sender and receiver:

1. *Mechanical* noise typically occurs when the individuals involved in the communication have poor basic communication skills, resulting in poor report writing and ineffective oral presentations. But ‘bugs’ in computer modelling software and errors in tables and diagrams due to incorrect copying of model output also constitute mechanical noise. This is connected to the level of **Valid**. Any actor can cause such a type of noise in any situation of decision making.

2. *Semantic* noise refers to poor understanding of messages across disciplines, and between academics and practitioners (or between suppliers and clients in general). Semantic noise occurs when the receiver gives a meaning to a message that differs from the meaning that was intended by its sender. The distinction between mechanical noise and semantic noise becomes clear in the following examples: If the client reads "the expected wave height in 2005 is 5.4 m" and uses this figure in his/her decision analysis, while the supplier actually wrote 4.5 m, this is mechanical noise. If the client interprets "the expected wave height in 2005 is 4.5 m" as "the expected *average* wave height in 2005 is 4.5 m", while the supplier actually computed the expected *maximum* wave height is 4.5 m", this is semantic noise. This feature determines whether the new knowledge is **Applicable** or not. Both client and supplier seem to be in control of appropriate presentation, applicability and use.
3. *Epistemological* noise refers to the distortion of messages due to differences on assumptions, frames of reference, images. Even if the channel is free of mechanical and semantic noise, the communication may fail because the sender does not accept the sender's message to be true. Properly distinguishing between semantic noise and epistemological noise is very important. If sender and receiver have different conceptions of what constitutes valid knowledge, they must resolve their differences at the fundamental level first. But epistemological noise can easily go unnoticed when the receiver interprets a message in his/her own manner. Conversely, semantic noise can needlessly suggest epistemological differences, and it will surely hamper their resolution. Just as the next type of noise, epistemological noise (and teleological noise) are indications of differences in policy paradigms and the belong to the levels **Applied** and **Effective**. It seems to belong more to client and stakeholder type of roles. Suppliers usually will not have the possibility to control and correct the use of the knowledge provided.
4. *Teleological* noise typically occurs in a context with multiple, conflicting objectives. When goal ambiguity and/or goal conflict is high, sender and receiver may have different views on the purpose of the message, i.e., its meaning in terms of the actions that should be taken on the basis of the message.

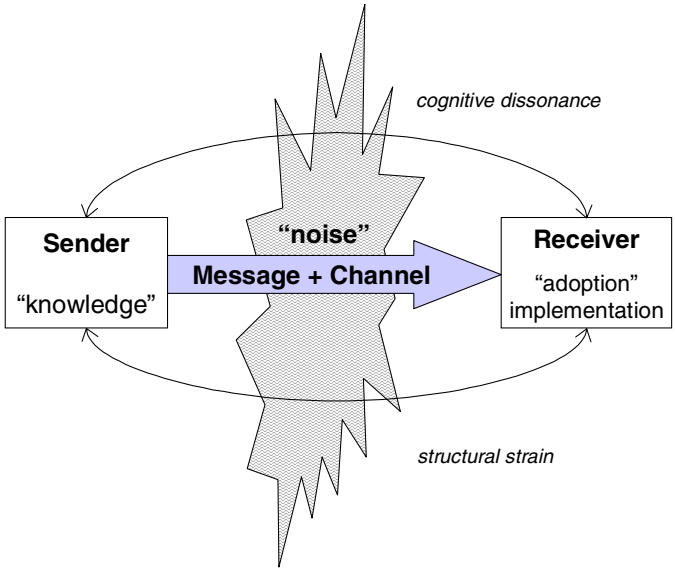


Figure 3.4. Knowledge transfer as communication between sender and receiver

In addition to noise, knowledge transfer may also fail due to incompatibility of the knowledge produced at the sender's end and user context at the receiver's end. This incompatibility can manifest itself at various levels, ranging from the individual (micro) level as *cognitive dissonance* to the societal (macro) level as *structural strain*.

- *Cognitive dissonance* refers to situations in which new knowledge does not fit ones understanding of how the world around him really is (Festinger, 1957). This may seem similar to semantic noise and epistemological noise, but it is a different thing. Cognitive dissonance can occur even when the sender and receiver share the same concepts. An ecologist telling a fisherman that the cod population is under severe strain may fail to transfer this knowledge when the fisherman has not noticed a significant change in his daily catch. The ecologist's message (the amount of fish in the sea is decreasing; you should catch less) is plain enough for the fisherman, i.e., free of noise, but it does not fit his real world experience (full nets on most of this season's trips; catch less means earn less). By consequence, the fisherman is not inclined to accept the new knowledge. The (indirect) client decides himself whether he uses the new knowledge or not.
- *Structural strain* refers to the inability of institutions to stretch and accommodate proposed changes. Even though the new knowledge is properly understood, the receiver is not capable to act upon this knowledge because the 'old' knowledge is too deeply imbedded in current practice. In our fishing example, even if government understands and acknowledges that the cod population is at risk, the present organisation of the fishing sector may not provide functional mechanisms (e.g., a central administration of fish trading places that keeps valid records per type of fish) to reduce the catch of cod.

The SMCR model provides a conceptual frame through which KTPs (KTPs) can be understood and eventually improved. By framing a KTP as a chain of communication links between actors (using the actor roles identified earlier) and then look for sources of noise, for cognitive dissonance, and for structural strain, we can identify problems and look for remedies.

3.8 Improving Knowledge Transfer Processes

If we look at the problems that may occur in a single link of a knowledge transfer chain involving communication between two persons, the co-orientation model provides useful concepts for diagnosis and improvement. The model is nicely summarized by Walter (1990), who writes:

"Co-orientation (McLeod and Chaffee, 1973) refers to a situation in which two (or more) individuals hold opinions or knowledge about some particular cognitive object – e.g., a plant, a practice, or sustainable agriculture as a whole. If they communicate about the object and their views of it, they can come to understand, shape, and perhaps share one another's views. Whether any of these happen, though, is far from certain; the individuals' orientations at a given moment, along with their perceptions of one another's orientations, help determine the terms of their communication.

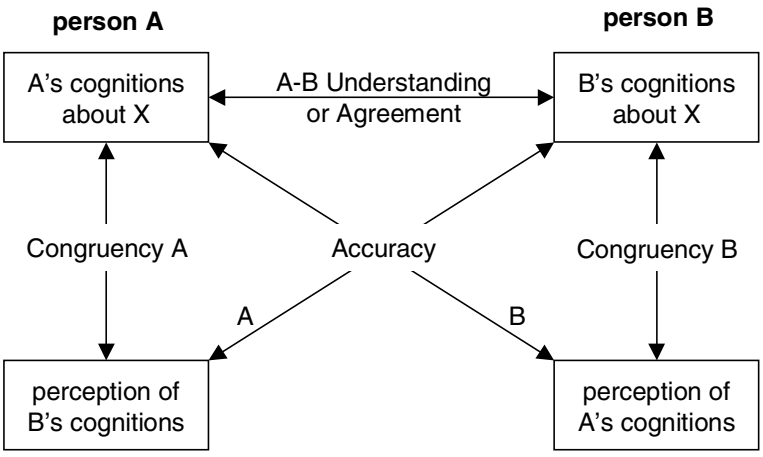


Figure 3.5. The co-orientation measurement model

McLeod and Chaffee's (1973) co-orientation measurement model (Figure 3.5) makes explicit key relationships that define the course of communication in co-orientation situations. The first, *agreement,* is simply the correspondence between communicators' orientations toward an object or issue; when their views are essentially similar, they can be said to agree in their orientations. *Accuracy* refers to the correctness of perceptions of others' orientations; if I believe another views an issue favourably, and in fact that is the case, I have an accurate perception of the other's orientation. *Understanding* of the reasoning or motives underlying the other's views can accompany accuracy. *Congruency* compares a person's own orientation with his or her perceptions of another's orientation; if my view of the issue matches what I think the other's view is, then my perception of the other's orientation is congruent with my own."

Walter (1990)then makes clear why the notion of co-orientation is valuable for improving KTPs:

"People or groups in a co-orientation situation can communicate regardless of their agreement, accuracy, understanding, or congruency. But the state of these relationships can shape both the content and outcome of their communication. If the communicators' orientations do not agree, their communication very likely will strive to produce agreement; each will either try to change the other's views or seek information to change his own. But *productive* communication – education, negotiation, persuasion – is severely hampered if one or another's perceptions are inaccurate (Meiller and Broom, 1979; Pearce and Stamm, 1973); their communication may first need to repair this problem. The chances for productive communication also diminish when either one fails to accurately recognize differences in the other's definitions of a problem or to understand the constraints he faces in acting to solve it – i.e., when either accuracy or understanding are low (Grunig, 1976; Grunig and Disbrow, 1977). Finally, if one or the other perceives their views are not congruent, that person's communication may be defensive or adversarial regardless of the actual state of agreement (Grunig 1976)."

The co-orientation model provides generic communication concepts (agreement, understanding, accuracy, congruency) that help in diagnosing a communication problem. But in his summary, Walter also brings up a crucial issue in knowledge transfer: the

awareness and understanding of differences in problem definition. The previous sections have made clear that a KTP cannot be viewed simply as a single 'knowledge transaction' between a policymaker and a researcher/consultant. A KTP is a complex chain of interactions involving different actor roles. Designing and managing a KTP requires identification (naming and framing) of the relevant interactions (the 'links' in the chain), diagnosis of their position in the decision-making context, definition of the client, the supplier, and the 'knowledge gap', and finding the proper mode of communication between client and supplier.

The template for evaluation we propose in the next chapter is designed to address this problem of a proper communication mode:

identify and properly diagnose communication links in the knowledge transfer chain,

addressing the topics mentioned above with the ultimate purpose of improving the effectiveness of a KTP.

The template should make client and supplier realize the following:

1. In general a knowledge gap has an interest not only for the client himself but also for stakeholders and actors related to the client. Therefore it is important that the communication of question is emphatically and consciously organized. It should be determined:
   1.1. Who has which interest (in terms of system implications or administrative consequences) in the answer yielded. Who will be affected by the implementation of the results?
   1.2. Did those actors have their impact and influence on the formulation of the question?
2. The client needs a process of sense-making in his own organization to accept and to decide to use the new knowledge. The sense–making can be stimulated by:
   2.1. a more conscious choice of participating in the knowledge generation
   2.2. organizing a review process along the process of knowledge generation in which members of the client's organization participate. Those reviewers should be representing both the client's organizational culture, DMC as well as the prevailing policy paradigm.
3. Both client and supplier should realize that the ultimate use of knowledge is a political decision: some knowledge will not be used because it does not fit/suit the enduser, no matter how well designed the KTP was or how valuable the actual results

4 Template for ex post evaluation of a knowledge transfer process

The set of assignments that makes up this template is intended to assess (and eventually improve) the quality of KTPs by focussing on the *utility* of knowledge: the supplied knowledge must meet a demand for knowledge.

Taking into account the findings we presented in section 3.5, we have structured the template in three parts, labelled A, B and C. The first part serves to get a crisp overview of the KTP, asking standard details (whereabouts/ without in-depth analysis. The second part (B) positions the knowledge need, the client and the supplier in a context of public decision making and its forthcoming requirements (organisation of the communication on the definition of knowledge need). Part C analyses the actual process of KTP (organisation of the communication between client and supplier). Each part is described in a separate section. This does, however, not mean that the parts can be dealt with independently.

The template has been developed for evaluation (*ex post*). It serves to uncover symptoms and possible explanations for success or failure of a KTP. It may also support design (*ex ante*) of KTPs. When used for design, the template calls for a number of decisions to be made with respect to the structure and scope of the process. The assignments may help to articulate objectives and constraints, and to think through alternative process designs.

We must emphasise here that the template has been designed for use by an *analyst*, by which we mean a person who observes a KTP from the outside. If the template is used by someone who is directly involved in the KTP, e.g., as knowledge client or knowledge supplier, s/he should be able to consciously assume the role of analyst.

Many of the questions in the template ask for answers from a specific actor perspective. Using the template for evaluation will therefore require involvement of individuals who took part in the KTP. Especially when the evaluation is the final stage of the process itself, it, too, must be organised with care, since reputations will be at stake.

Each question in the template is punctuated by the phrase *Analyst evaluation:* **Is this OK?** This phrase emphasises that the information that is generated by performing the assignments should be judged against the set of normative propositions immediately following the OK-phrase.

4.1 Section A. Overview of the knowledge transaction

Part 1 of the template serves to articulate supply and demand by framing a KTP as a specific knowledge transaction between two parties: the knowledge client and the knowledge supplier.

Assignment A0. Short case description

Summarise the knowledge transfer process in no more than 100 words.

Explanation: This assignment serves to set the scene in plain words. The analyst must try to capture the essentials of the KTP: What knowledge was to be transferred, from whom to whom, and why? In what phases did the process proceed? Does the project have a reasonable set-up at first sight? Are the primary actors sufficiently competent? How complex is the context of surrounding actors?

Analyst evaluation: **Is this OK?**

The short case description is valid, i.e., it properly represents the KTP as a whole, outlining the knowledge transfer objectives, the actors involved, and their main activities in the KTP.

The KTP makes sense, i.e., the knowledge transfer objectives are realistic and the actors involved are relevant.

Assignment A1. Define the situation of decision making situation

(a) Using the diagram below, specify which mode characterizes best the decision-making situation as it is perceived by the knowledge client?

(b) Using the diagram below, specify which mode characterizes best the decision-making situation as it is perceived by the knowledge supplier?

	Goal ambiguity/conflict	
Technical certainty	**low**	**high**
high	**rational mode** Goal-directed Guided by rules, routines and performance programs	**political mode** Conflicting goals, interests Certainty about preferred approach and outcomes
low	**process-mode** Goal-directed Multiple options and alternative solutions	**anarchistic mode** Goals ambiguous Processes to reach goals are unclear

Explanation: This assignment should give insight in the context of decision making. Depending on the situation decision-making, knowledge need and associated processes are different. Four typical situations (arranged along two axes) can roughly describe all types:. The two axes are “Technical uncertainty” ranging from low to high and “goal ambiguity (amount of conflict)” also ranging from low to high. These two axes result in a two*two matrix. Each type of KTP requires its own process and organisation but have both client and supplier been aware of the situation?

In the *rational mode* the knowledge need is typically know-how and know-when knowledge: formalised routines. Usually the KTP yields performance indication which will lead to minor adaptations of the existing routines and models of operation. In the *process-mode*, the organisation needs to define the problem, next develop a number of alternative solutions and evaluate those with an evaluation system. In the initial phase of problem definition and formulation of alternatives, KTP can be characterised as generating know-what. At the stage of evaluation and decision-making KTP converts to know-why. In the *political model*, the various potential technical solutions are clear but the goals are contested by various interest groups. For decision-making it is important to know who is involved,

who has what interests, has which stand, has which influence and how the groups are interrelated. For interdisciplinary collaboration it is important to know who has which knowledge, what value that knowledge has, and if it is available through functioning lines of communication. All together this type of knowledge can be defined as know-who. In the *anarchistic mode* both goals and technical solutions have high levels of uncertainty. Problems, solutions, participants each have their own timing and schedule. In principle, all participants are still equally important (in contrast to the political mode). Decisions are only made when all important aspects coincide accidentally. The knowledge need in such a situation can be of any type of knowledge, although it is of major importance to know-who is in the arena. Know-who is the most important to be able to define potential alliances.

Analyst evaluation: **Is this OK?**

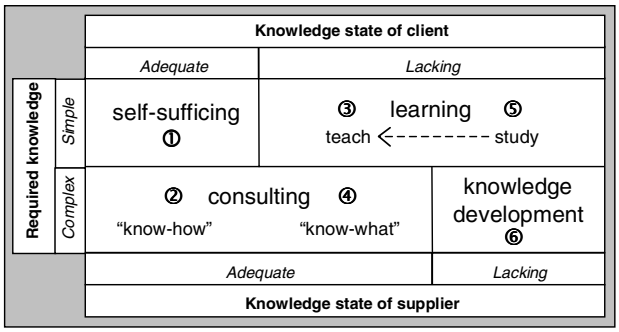
Firstly, the organisation of the context of the question is important in relation to the decision-making mode. The client's and supplier's view are consistent with the outcome of A3 and B3 (q.v.).

Secondly, the applicability of the answer is important. The client's and supplier's view are consistent with the outcome of A5 (q.v.).

There is no discrepancy between the client's view and the supplier's view.

Assignment A2. Type of knowledge transfer situation

Using the diagram below, specify:
(a) the type of knowledge transfer situation as it is perceived by the knowledge client
(b) the type of knowledge transfer situation as it is perceived by the knowledge supplier



Explanation: This assignment calls for a first diagnostic, using three dimensions: the complexity of the knowledge involved, the knowledge already available to the client, and the knowledge already available to the supplier. The point of this exercise is that knowledge client and knowledge supplier may have different perceptions of the situation. The analyst should check this, because such a discrepancy may cause problems in the KTP.

The diagram helps to broadly characterise the type of knowledge transfer. If the client possesses the required knowledge, there may be ① no need for knowledge transfer from supplier to client, or ② the client may not know how to process (e.g., collect, structure, select, combine, deduce, apply) this knowledge. If neither the client nor the supplier possesses sufficient knowledge, simple knowledge can be first ⑤ acquired by the supplier and then ③ transferred to the client, while complex knowledge may call for ⑥ joint knowledge development. In the more likely situation that the supplier has knowledge that the client is lacking, this knowledge may be ③ simple, in which case it the client can acquire this knowledge for immediate and future use (the client's knowledge level becomes

adequate), or ④ complex, in which case the supplier assists the client with knowledge to perform the complex task at hand and the client will need such assistance again in the future (the client's knowledge level remains lacking). Situations in which the knowledge level of the client is adequate and that of the supplier is lacking would seem imaginary, since they imply a role reversal between client and supplier.

Analyst evaluation: **Is this OK**?

- ☐ The client's view is consistent with the outcome of A3 (q.v.).
- ☐ The supplier's view is consistent with the outcome of A4 (q.v.).
- ☐ There is no discrepancy between the client's view and the supplier's view.

Assignment A3. Question articulation by knowledge client

Specify:

(a) the name of the knowledge client
(b) the client task (typically: decision making) as it is perceived by the knowledge client
(c) the client's knowledge need as it is framed by knowledge client
(d) the (part of the) knowledge need the client expects to be met by the knowledge supplier
(e) the specific question as it is posed to the knowledge supplier

Explanation: This assignment should give insight in the knowledge demand and the process of 'translation' of demand into a specific question that takes place within[1] the knowledge client. The first step is to define this client (a). This may be an individual or (more likely) an organisation. It is assumed that the knowledge demand originates from the need to perform a particular task and to achieve goals accordingly. The client is required to act and feels s/he lacks sufficient knowledge to act adequately and responsibly. The next step for the analyst are therefore to delineate this client task (b), typically by specifying what problem needs solving and what decisions need to be made. From this, the analyst tries to elicit the lack of knowledge as it is framed by the client (c). The word 'framed' here reflects the basic assumption that the client mentally constructs his/her knowledge need on the basis of what s/he perceives to be the task and what s/he sees as knowledge that is already available. It will often occur that the knowledge need cannot be met by a single supplier or in a single transaction. The client may implicitly or explicitly select some subset of the required knowledge (d) and then make this subset explicit by formulating a specific question (e) that is then posed to the knowledge supplier.

Analyst evaluation: **Is this OK**?

- ☐ The named person or organisation indeed has the role of knowledge client; this is consistent with the outcome of B1.
- ☐ The task is a clear description of a purposeful (decision making) activity in which the client has specific objectives s/he wishes to achieve with this task, as well as adequate means (authority) to perform it.
- ☐ The total knowledge need as framed by knowledge client is consistent with the task objectives, the means of the client, and the knowledge already possessed by the client[2]. Was this knowledge need congruent with the mode of decision-making?

[1] *Possibly in interaction with the supplier, but the aspect of interaction between actors is addressed and analysed in part C (Communication) of the template.*
[2] *The analyst should assume rational, purposeful client behaviour here.*

- ☐ The knowledge need the client expects to be met by the knowledge supplier is a subset of the outcome of A3(c).
- ☐ The specific question posed to knowledge supplier is consistent with the outcome of B3(d), i.e., it addresses a specific part of the knowledge need as framed.

Assignment A4. Answer formulation by knowledge supplier

Specify:

(a) the name of the knowledge supplier
(b) the supplier task (typically: knowledge development) as it is perceived by the knowledge supplier
(c) the client's knowledge need as it is framed by the knowledge supplier
(d) the knowledge processing that is performed by the knowledge supplier
(e) the relevant results as they are framed by the knowledge supplier
(f) the answer delivered by the knowledge supplier to the knowledge client

Explanation: This assignment should give insight in the supply side of the knowledge transaction. Here, the focus is on the 'translation' of the question posed by the knowledge client into knowledge processing activities that eventually produce an answer to that question. Like the knowledge client, the knowledge supplier (a) may be identified as a (compound) actor. The task (b) of the supplier differs from the client task: the knowledge supplier does not have to make the client's decisions; s/he has to solve the derived problem of how to obtain an answer to the question posed by the client[3]. This will typically involve an interpretation of the question, which leads to the knowledge need as framed by knowledge supplier (c). This, then, is the basis for the knowledge supplier to decide what specific the knowledge processing activities (d) should be performed, and what results (e) will be relevant for the client. The knowledge processing activities typically include making inventory of existing knowledge within the supplier's organisation, identifying what knowledge is lacking, filling this gap by knowledge creation, external knowledge acquisition, and synthesis. The results of the knowledge processing activities constitute the basis for the answer (f) that the knowledge supplier thinks to be most adequate for the knowledge client.

Analyst evaluation: **Is this OK?**

- ☐ The named person or organisation indeed has the role of knowledge supplier; this is consistent with the outcome of B3.
- ☐ The supplier's task is a clear description of a set of purposeful knowledge generation and/or knowledge processing activities, that will result in specific knowledge products.
- ☐ The client's knowledge need as framed by knowledge supplier is consistent with A3(d) and covers the question formulated under A3(e).
- ☐ The knowledge processing performed by knowledge supplier is a subset of the outcome of A4(b) and produces the knowledge as identified under A4(c).[4]
- ☐ The relevant results as framed by the knowledge supplier are a product of the supplier's knowledge generation and/or knowledge processing activities.

[3] *The type of question is likely to depend on the type of knowledge situation established in assignment A2.*

[4] *Efficiency criteria that might be applied to the supplier task should be deferred to B3(d,e) and B.4(d).*

- ☐ The relevant results as framed by the knowledge supplier include the knowledge the client asked for, i.e., the outcome of A3(d).
- ☐ All results as framed by the knowledge supplier are indeed relevant in view of the client's knowledge need, i.e., the outcome of A3(c).
- ☐ The answer delivered by the knowledge supplier to the knowledge client provides a complete answer to the client's question formulated under A3(e).
- ☐ The answer delivered by the knowledge supplier is presented in a way that helps the client understand how the knowledge product suits his/her needs.

Assignment A5. Evaluation of the answer
For evaluation of the answer delivered by knowledge supplier to the knowledge client, specify:
(a) the answer as it is received by the knowledge client
(b) the usefulness (in the eyes of the client) of the received answer in performing the client task

Explanation: This assignment must yield information on how the knowledge transaction is concluded. This involves a third 'translation': the knowledge client not only receives the answer delivered by the knowledge supplier (e.g., as a written report), but also interprets its meaning. The knowledge the client actually gains (a) from the answer delivered by the supplier may differ from the intended content. The analyst should try to determine whether the difference is significant. The analyst should also try to determine whether the answer as received is useful (b) for the client, i.e., whether it allows the client to deal more adequately with his/her problem-solving/decision-making task.

Analyst evaluation: **Is this OK?**
The client correctly interprets the substantive content of the knowledge product delivered by the supplier. The client correctly interprets the 'instructions for use' (if explicit) included in the knowledge product. The client benefits from the knowledge product in his/her task performance. How does the knowledge provided function in the decision making. (In an ideal case the knowledge provided makes the decision making mode shift to a mode with more certainty.)

4.2 Section B. organisation of the communication on knowledge need

Part B of the template focuses on actors and the specific roles they can play in the KTP. Actors with their specific interests/responsibilities and means of influence/authority can affect both the knowledge demand and the knowledge supply, and, by consequence, co-determine the eventual success of the process. The assignments in this part of the template serve to articulate the actor context of the knowledge transaction.

Table 4.1. Role types in client context

Policymaker	can establish or modify policies (and programs), which, through implementation, affect problem situations
***Sub-roles*:**	
- *nominator*	recommends a particular option, or presents a short list with several promising options (for example, the civil servants in the advisory staff of a Ministry)
- *selector*	chooses the preferred option, but not necessarily from those offered by the nominator (for example, the Minister or the Cabinet)
- *ratifier*	may veto, approve, or modify the selector's choice (for example, the Parliament)

Implementer ***Sub-roles*:** - *installer* - *operator* - *implementation manager*	attempts to execute the policy chosen by the policy maker. This requires adapting the general policy to make it more practical, to resolve open issues, and to accommodate new political concerns creates the facilities or assembles the resources necessary to get the policy into operation (for example contractors who build new dams or other works) is responsible for the day-to-day operation of the implemented policy (for example, the intended daily users of the '*Leidraad*') develops guidelines, prepares plans, administers contracts etcetera, and may select and manage the installers and operators or perform some of their functions (for example, Rijkswaterstaat)
Stakeholder	is directly affected by the policy (for example, those threatened by floods), or indirectly affected (for example, future generations or workers in indirectly related industries, such as concrete production for building water works)
Lobbyist	seeks to influence policy makers toward a particular viewpoint. Lobbyists may be persons affected by the problem situation, or persons outside the immediate scope who are merely concerned with the problem situation
Evaluator	compares the actual effects on the problem situation with the expected effects after the implementation of a policy or program
Enforcer	is an evaluator who has the power to enforce policy changes if s/he observes that an implemented policy performs unacceptably
Advisor / Analyst	supplies information, conducts analyses, recommends action, suggests political strategy or provides emotional support. Analysts are usually involved in knowledge transfer as advisors, the main difference between analysts and other advisors being the degree to which their recommendations are neutral and transparent

Table 4.2. Role types in supplier context

Problem poser	defines the problem and the knowledge that is to be provided by the analysis team
Sponsor	commissions the work and sees to its support. The sponsor commonly selects the research organisation to perform the analysis, determines the funding level and may influence staffing. S/he also participates in problem definition and reviews progress and findings
User	makes use of the study findings while performing a specific task. Users can have any role in the client context (policymaker, implementer, stakeholder, lobbyist, evaluator, enforcer, advisor/analyst)
Analysis team	designs, plans, performs and documents the study
Research program director	When multiple analysis projects are underway in an organisation, similar projects are often organised as a research program, managed by a research program director. The program director usually selects a project leader, helps negotiate the research agenda with the sponsor, and reviews progress and findings. S/he may allocate resources among competing projects and determine which prospective projects will start. The strategic plan for the program reflects such goals as building intellectual capital for the analysts, promoting synergy among projects, developing a centre of expertise, and creating a foundation for growth into new areas.
Advisor on the analysis	provides guidance to the analysis team in designing and conducting analysis. Advisors are often formal advisory groups, called study advisory group (to guide on the scope and emphasis of the research), steering committee, or technical advisory group (to provide data and expertise on concrete and specialised aspects of the problem).
Formal reviewer	reviews both the analysis process and its outcomes and judges their quality
Implementation planner	performs analysis specifically to assist implementation planning or other decision making by implementers

Assignment B1. Defining the knowledge client

For understanding the internal organisational structure of the knowledge client, specify:
(a) the names and role type(s) of the individuals who constitute the knowledge client
(b) the formal relationships between these individuals
(c) their specific responsibilities in relation to the client task

Explanation: This assignment must give insight in the 'internal structure' of the knowledge client. In many cases, this actor is not a single individual, but some subset of individuals

within an organisation. The process of articulating the question that is eventually posed to the knowledge supplier will involve interaction between these individuals, and this interaction and the roles that the individuals play in this interaction deserve careful evaluation. Individuals are to be identified by their name and the organisational unit they are part of. The role types in table 4.1 can be used to specify their role in the KTP. Spectrum 4.1 gives an overview of the different positions of the actors in the process of policy and decision making. In addition to the names and roles of individuals (a), it is useful to also specify the formal relations between the individuals (b). These may be hierarchical relations (who is the boss?) but other, more subtle dependencies (do John and Mary also work together in some other project?) may be relevant. Related, but not necessarily identical, to the formal relationships between these individuals are their specific responsibilities in relation to the client task (c). The following example illustrates the difference:

Coastal zone authority (CZA) has to decide whether or not to permit the development of a beach camping resort. Andrews is chairperson of CZA and has the decision making authority and will be held responsible for the CZA decisions. Baker is secretary of CZA and charged with writing up CZA's decisions and motivations, and also responsible for obtaining the necessary information. Carter is junior staff member at CZA and personal assistant to Andrews. Carter is asked to perform an impact assessment for the plans for a beach camping resort. Andrews has the combined role of policymaker/selector and policymaker/ratifier, Baker has the role of policymaker/nominator, and Carter has the role of analyst. Andrews is the boss of both Baker and Carter. There is no hierarchical relation between Baker and Carter, but Baker has a budget for hiring external expertise and Carter will have to draw from this budget.

Analyst evaluation: **Is this OK?**

- ☐ The individuals involved in the KTP can easily be identified.
- ☐ The formal relations between the individuals are clearly defined and commonly known.
- ☐ All necessary roles are filled in.[5]
- ☐ Those with responsibilities have appropriate means and authority to meet them.
- ☐ The organisational structure of the client facilitates communication among individuals.

Assignment B2. Knowledge client context

For understanding the organisational context of the knowledge client, specify:

(a) the name and type of stakeholders, i.e., the actors who take an interest in the knowledge client's task performance

(b) the formal relationships between these stakeholders, the knowledge client and the knowledge supplier

(c) the specific responsibilities of these stakeholders within the client context

Explanation: This assignment must give insight in the 'organisational context' of the knowledge client. The knowledge client is seen as one particular actor in a network of actors. Obviously, the knowledge suppliers are important actors in this network as well. The other actors in this network are stakeholders in the KTP when they depend on the quality of the task performance of the knowledge client, for example because they may gain or lose depending on the decisions made by the knowledge client. Do those parties which could add relevant aspects to the context of a question have access to the process of defining the

[5] *What roles are required depends on the type of KTP.*

question? Depending on the decision making mode the value/weight of the actors can be different. It may also be useful to consider actors in other roles than that of supplier or stakeholder. This time, the role types in both Table 4.1 and Table 4.2 can be used to specify their role in the KTP. Again, in addition to the names and roles of actors (a), it is useful to also specify the formal relations between the individuals (b), and the formal responsibilities of the stakeholders (c).

Analyst evaluation: **Is this OK?**

- ☐ The stakeholders in the client's context can easily be identified.
- ☐ The interests of the actors in the total project and the specific question posed. Does the institutional frame fit to the KTP required? Was the communication between client and actors organised in such a manner that information exchange was sufficient
- ☐ Does the type of mode the decision-making is in had any consequence for a change in relationships or dependencies?

Assignment B3. Appropriateness of the client's question

To determine whether the question does justice to the client actor context, specify:

(a) interests and (knowledge) needs of individuals within knowledge client

(b) interests and (knowledge) needs of stakeholders in knowledge client context

(c) attitudes of these actors towards knowledge question as posed to knowledge supplier:

- *specific interest in client task*
- *specific interest in (= \|potential utility of\|) question as posed to knowledge supplier*
- *actual utility of answer provided by knowledge supplier*

(d) other knowledge transactions (planned or ongoing) initiated by knowledge client

(e) interfaces with these other knowledge transactions:

- *substantive: relations between questions addressed in these other transactions*
- *procedural: coordination and information exchange*

Explanation: This assignment relates the question formulated in assignment A3(e) to the actors identified in assignments B1(a) and B2(a). The interests and knowledge needs of these actors (a and b) can in part be derived from their responsibilities as specified in assignments B1(c) and B2(c). The next step is to focus specifically on the interest these actors may take in the knowledge client's task (c). Here, the analyst must consider whether the client's task performance (in particular the decisions s/he makes) is of consequence to the actors in the client's context. Also, the analyst must check whether the question as it has been framed by the client may result in knowledge that is useful to other actors, or *would have been useful* if the question had been framed differently. Both considerations serve to determine the utility (value) for other actors of the knowledge that will be delivered by the supplier. What are the wishes and interests of the actors? Has the client acted accordingly. What are the implications of not having listened to those demands? The last part of the assignment serves to identify any other KTPs in which the client is involved, since these might be more or less strongly related to the specific transaction that is being designed / evaluated.

Analyst evaluation: **Is this OK?**

What are the wishes and interests of the actors? Taking the decision making mode into consideration do the actors have had the appropriate weight (influence on the definition of the knowledge need? Has the client acted accordingly? Do the stakeholders have to be

engaged on jurisdictial grounds or because they are highly influenced by a decision? What are the implications of not having listened to those demands? Do those parties which could add relevant aspects to the context of a question have access to the process of defining the question? Are the wishes and interests compatible with their role in the project? Can the way the question is organised and the amount of influence stakeholders can execute on the question attribute positively in achieving more certainty in the decision-mode. Are the interests compatible with the scoop of the project?

Assignment B4. Appropriateness of the choice of supplier

To determine whether the question does justice to the supplier actor (partners, competitors, users) context, specify:

(a) interests and (knowledge) needs of individuals within knowledge supplier

(b) interests and (knowledge) needs of stakeholders in knowledge supplier context

(c) attitudes of these actors towards knowledge question as framed by knowledge supplier:

- *specific interest in supplier task*
- *specific interest in (= \|potential utility of\|) question as framed by knowledge supplier*
- *actual utility (for actor) of knowledge produced by knowledge supplier*

(d) other knowledge transactions (planned or ongoing) in which knowledge supplier is involved

(e) interfaces with these other knowledge transactions:

- *substantive: shared variables, models or expertise*
- *procedural: coordination and information exchange*

Explanation: This assignment is similar to the previous one, but focuses on the actor context of the knowledge supplier. Here, the analyst should focus first on individuals within the supplier's organisation (a), and then on actors outside this organisation (b), who may take interest in (the results of) the knowledge processing that the supplier will perform to deliver an answer to the client question. What is the interest of the partners involved. Does the study benefit from other studies performed. Or does the study yield results applicable for other assignments. Who are the competitors and are they still involved somehow in the study? Can one define other users as well (except the client). For example, individuals or other organisations might want to participate in knowledge development, contribute their own specific knowledge, or make use of the resulting knowledge. By specifying these interests, the analyst may assess the attitude of these actors (c) towards the knowledge question and how this may (have) affect(ed) the success of the KTP. The last part of the assignment serves to identify any other KTPs in which the supplier is involved, since these might be more or less strongly related to the specific transaction that is being designed / evaluated.

Analyst evaluation: **Is this OK?**

What is the interest of the suppler according to the analyst? Are those the same that the supplier and client claim to be? Are there any hidden agenda's? Is there a threat of conflict of interest? Is all maximum available knowledge being used?

4.3 Section C. Organisation of the communication between client and supplier

Part 3 of the template focuses on the communication between all the actors who are involved in the KTP. Although the essence of the knowledge transaction can be captured in two messages – the specific question posed by the knowledge client and the answer delivered by the knowledge supplier – this does not do justice to the complexity of interactions between the many actors in the KTP. Both these interactions in themselves and the way in which they are arranged will affect the success of the KTP.

Assignment C1. Message exchange
For more detailed insight in the knowledge transfer process, identify:
☐ *messages sent by knowledge client to knowledge supplier*
☐ *messages sent by knowledge supplier to knowledge client*
☐ *messages exchanged by other actors*

For each message, specify:
- sender(s) and receiver(s) [use actor names and actor roles as identified in template part 2]
- other actor involvement
- time of message exchange
- type of message [substantive, reframing, managerial, evaluating]
- content of message [key words only]
- medium [e.g., letter, report, interview, workshop, …]

Explanation: This assignment must give insight in the number and type of interactions: message dealing the entire content and process of knowledge transfer. In essence it is a factual identification and specification of the interactions between actors. What was the message? Where the right actors involved in this message. Has the correct medium been used to transmit this particular message.

Analyst evaluation: **Is this OK?** (to be checked for each message). This assignment yields the basic information which is interpreted in assignment C2. It is important to determine if one has obtained a complete overview of the communication.

Assignment C2. Knowledge transfer process over time
To see the KTP as a whole, visualise message exchange over time:
(a) by actor involvement
(b) by message type

Explanation: This assignment must give insight in the interaction in relation to the entire process from the inception phase till the final distribution of the results. In this entire process we distinguish a number of layers: the organisation of the KTP, the usefulness of the information for the end user and the (scientific) validity of the knowledge (to be) provided. Depending on the moment in time, each layer will be more important or less. Is the content of the messages exchange in accordance with the information needed at that moment. A typical profile of a KTP could be, for example:

an initial phase in which the organisation is important;

then a phase where both usefulness and approach for validity to achieve this usefulness are defined;

a phase with a prominent role for validity with the two others in the background;

then an intermediate moment where the rough new knowledge is tested for its usefulness

again a phase were with a prominent role for validity while the two others are in the background;

and a final phase were the product is disseminated and tested upon its validity and usefulness.

Organisation will have different intensities along this time course. Depending on the project, each KTP will have its own ideal time course and associated frequency of messages.

The information yielded by these questions will help to analyse whether the right procedure has been followed to obtain the knowledge wanted.

Analyst evaluation: **Is this OK?**

Can one see that at the appropriate moments the KTP has paid its attention to organisation, validity and usefulness. Considering the usefulness and the potential use of the knowledge have the right actors (stakeholders) been consulted at the appropriate moment. Take the decision-making mode into account for this evaluation. The client should organize a review process along the process of knowledge generation in which members of the client's organization (in the broadest sense) participate. Those reviewers should be representing both the client's organizational culture, the deciding authorities as well as the prevailing policy paradigm.

Spectrum 4.1: Full spectrum from ratifier to scientist

Politics		**Science**
ratifier ..… selector … nominator … policy analyst … expert … scientist […..policy maker]		
Democratise Clarify values Mediate Research and analyse Design and recommend [Strategic advise]		
[Decision making] [Implementation] [Evaluation]	Problem-definition Solution-definition	[environmental impact] [monitoring]
Institutional	*Stakeholderprocessen*	*natural system*

5 Discussion

We have performed an extensive search into the success and failure factors in knowledge transfer from knowledge suppliers (like GTI's as WL | Delft Hydraulics) to clients in the public sector dealing with water management (like RWS-DWW and RWS-RIKZ). During this search, we used tools like discussions and workshops to mobilize the tacit experience of suppliers, knowledge mediators and clients, templates of analysis to analysis actual cases of knowledge transfer (by filling in the template through interviews) and literature review to refine our template of analysis, and interpreted our results.

In this discussion we will first make a crisp inventory of the causes of failure in KTPs and potential remedies. Next we will position our final template for evaluation in this inventory, demonstrate its added value in comparison with the analysis of failure factors already existing. We will show how the template deals with the failure factors that we think deserve extra attention. Then we will evaluate how the final template for evaluation was received by the professional community of suppliers, mediators and clients. Finally we will evaluate KTPs in Dutch water management; both the situation in general and the cases specifically.

5.1 A crisp overview from literature of causes and remedies of failures for KTPs

In our search for concepts and mechanism to improve KTPs, we encountered a variety of examples of how and why KTP can fail. In Chapter 3 we bring these findings together in a conceptualisation and interpretation according to a synthesis of i) the model of noise in the communication (Vlachos, 1978) and ii) KTPs in view of decision making. However, literature also provides a long list of single failure factors which are not so completely caught and discussed by the synthesis and model of framing we have designed in Chapter 3. In this section we present an overview structured according to different acknowledged levels of knowledge use (Figure 2.2) of valid, applicable, applied and effective. This will allow us to judge to what extent the suggestions we made in Chapter 3 and the template presented in Chapter 4, provide an adequate answer to these problems. In addition this additional method of framing enables us also to elaborate on and position the higher scales of use (applied, effective) where both Chapter 3 and the final template focused more on the levels valid and applicable.

The literature findings urged us to detail the model by refining the four scales of use into a main scale with two subscales resulting in more abstraction levels. Each main scale was assigned to a specific player in the field of KTP: valid was assigned to the supplier; applicable to the client; applied to the organisation of the client; effective was assigned to the policy context (the total field of potential users). The subscales stand for responsibilities in either the interaction with the next lower or the higher level. The highest level was not subdivided. For each type of failure also a remedy will be suggested. So as compared to the model of framing in Chapter 3 (acting from the point of view of the characterisation of knowledge and decision making), the model below frames the KTP more from the point of view of the organisational unit acting.

One should be careful in blaming entities for failures. The model of framing seems to attribute the responsibility of a particular failure to the entity assigned to that particular (sub)level. The framing, however, is for analysis sake not for assigning so much responsibilities although the particular entity seems the most appropriate to undertake the most efficient measures. *Nota bene*: in our view, framing leads to awareness of the failure factors in all parties involved and thereby responsibility for the entire KTP for all parties. The following sublevels were characterised:

1. Valid: data availability and research characteristics
2. Valid: supplier side
3. Applicable: client and his knowledge gap
4. Applicable: client communicating with his direct environment
5. Applied: organisational structure of the client
6. Applied: process of knowledge use
7. Effective: process of knowledge making in a societal context

In the remainder of this section, we summarize the failure factors for each (sub)level.

Valid: data availability and research characteristics

- Not enough data available (Stone et al., 2001, Bots et al., 2002, Van de Riet, 2003): Whether due to a lack of funding or too high system complexity, in general there is 'never enough' data available to describe a situation completely, leading to incomplete knowledge on which a decision has to be made. How to overcome such a thing? Will there ever be enough data? One could argue the best solution is a proper design of decision making which will satisfy all stakeholders involved. This will surely reduce criticism on the approach. The danger of this attitude is that it reduces the sense and urge for true innovation. It appears that the daily life of decision making accepts this draw back and continues a certain policy paradigm until it is really not acceptable anymore. See eg the examples mentioned in the third order changes of policy paradigms in chapter 3.6.
- Insufficient or no dissemination and access to research, data and analysis (Landry et al., 1998, Kosten & van Woerkum, 2000, Stone, 2001, the DC-projects referenced in the Introduction): Various methods have been developed to improve dissemination of the information available. Examples are eg. a platform to bring together clients and suppliers with data banks and search engines to increase information availability. Both clients and suppliers should be more aware of the existence or the availability of this browser type of meta information.
- Tacit knowledge remain unarticulated (Leonard-Barton, 1995, Choo, 1998, Johnson & Lundvall, 2001): Part of the total knowledge remains tacit in the supplier and does not become explicit and available for the client. In addition clients remain unaware about the existence of this knowledge. Active mediation through advertisement or recommendation of existing tacit knowledge is advised. Another mechanism is the active sharing of knowledge by an interactive learning situation. A good design of the process of making knowledge in which the client is more involved, can help too.
- Incorrect study to answer the question (Van Koningsveld, 2003): it can occur that a study is not 100% effectively designed to answer the question posed. This can

happen due to skill, experience, time, money and even strategic considerations. Experience and a good intake conversation (eg with the help of the template for evaluation of Chapter 4) can help to overcome this problem.

Valid: supplier side

- Ineffective communication by suppliers (Landry et al., 1998, Stone et al., 2001, van Koningsveld, 2003, Van de Riet, 2003): Suppliers should develop different strategies of communication and dissemination. Differences in (the needs of) clients (like governments, politicians, managers, NGO's, media etc.) require different methods of approach: the right product on the right place on the right time! They need to pay attention to the quality of presenting the data: complete, precise, descriptive, illustrative and understandable.
- Weak personal relation between supplier and client (Leonard-Barton, 1995): The transfer of knowledge is enhanced in a collaboration. Bad interpersonal relations can threaten the quality of the product and the willingness to accept the results. A good personal relation (and thereby collaboration) enhances the KTP.
- Poor awareness of policy and political aspects by suppliers (Peters, 1996, Landry et al., 1998, Choo, 1999, Lomas, 2000, Stone et al., 2001, Van de Riet, 2003): In general, researchers lack appreciation for the fact that knowledge is used in a relative sense: suitable at the moment of use to serve a certain goal. And that it is not validated for its absolute "truth" value. Suppliers should realize this (and not get frustrated).
- Poor understanding of the policy process by suppliers (Twaalfhoven, 1999, Lomas, 2000): both research and policy making are cyclic processes in which problem and solutions are constantly redefined. However they have each their own timescales. Matching the different cycles and stages of both processes would make the process of knowledge generation itself a vehicle for knowledge transfer rather than knowledge transfer through the end product (e.g. a report) only. The knowledge product and KTP should be sufficiently fitting policy process and policy needs.

Applicable: client and his knowledge gap

- Poor translation of the problem to the question (Section 2.3, Van Koningsveld, 2003): in general this type of problem arises when the assignment does not contain enough clues for the appropriate comprehension by the supplier. The reasons can range from skills of the client, strategic and pragmatic consideration up to poor initial insight into the problems changing with progress of the answer. A template like we have developed, could help to improve the formulation of the question.
- Not answering the question behind the question (Section 2.3, Bots et al., 2002, Van Koningsveld, 2003): a specific elaboration of the point above: were all interests of all stakeholders represented in the formulation of the question? Or were these interests addressed in the answer? A template like we have developed, could help to improve the formulation of the question.
- Type of contract that implicates a large distance between client and supplier (Badaracco, 1991, Leonard-Barton, 1995): In general, contracts like non exclusive licensing and general R&D contracts generate less commitment on the client side than joint ventures, merges and acquisitions (of entire departments, industries, etc.).

The former forms do tend to give less insight in each others culture than the later. A client should be aware of the potential consequences and choose according his needs (see also next item).

- Lack of a mutual component in the process of knowledge making (Leonard-Barton, 1995, Twaalfhoven, 1999): especially clients prefer a well organized process with regular exchange of insights to be able o fit the new knowledge in its organizational culture. More specifically a genuine co-production enhances the extent of knowledge transfer. This is something to consider when deciding for a type of KTP tendering and contract.

Applicable: client communicating with his direct environment

- Ignorance of politicians or decision-makers (Peters, 1996, Stone et al., 2001): not only availability of information but also attitude or capacity of the persons involved can hamper the use of knowledge. Research brokers, policy entrepreneurs and interactive dissemination (platforms or communities of practice) can help to increase the use of information and knowledge in the decision making.
- Lack of sense making (Badaracco, 1991, Choo, 1998, Twaalfhoven, 1999, Stone et al., 2001): Knowledge is brought from one organization (supplier) into another (client) but has to be accepted (given sense) by the client's organisation. If both organizational cultures (in terms of beliefs, cultural knowledge [norms, criteria] and preferences) are different, this could seriously hamper the incorporation of new knowledge. The new knowledge should fit the policy paradigm of the client (or explicitly defend why it does not fit). In this sense it is important that the client has an internal structure which facilitates the dissemination of and reflection on knowledge and information internally (see also the failure factor of "closed culture" below).

Applied: organisational structure of the client

- Closed culture (Leonard-Barton, 1995): the client's culture can be orientated inwards or outwards. It is obvious that the later culture will facilitate KTP. Active registration by all members of the organisation to managers of the appropriate level can improve dissemination of findings.
- Structural incapacity of the managing (decision making) organisation (Leonard-Barton, 1995, Peters, 1996, Stone et al., 2001): society is becoming increasingly complex, requiring both a managing (decision making) organisation that can operate in a horizontal manner and techniques that are flexible and creative forms of intervention. Ideally these instruments respond to a wider range of conditions than the target variable. However, is the managing organization such a well organised machine: in general not. In addition governments tend too loose highly qualified, experienced personnel. Experience is necessary for a successful KTP. So it is advisable to integrated experienced people in a KTP.

Applied: process of knowledge making in a societal context

- No connection with decision making routines (Choo, 1998): after given sense to

new knowledge, it has to be decided whether the knowledge will be used on the basis of preferences, rules and routines. The application of new knowledge could be stimulated to position this knowledge favourable in these sets of formalised references.

- Poor understanding of the research process by clients (Twaalfhoven, 1999, Lomas, 2000): both research and policy making are cyclic processes in which problem and solutions are constantly redefined. However they have each their own timescales. Matching the different cycles and stages of both processes would make the process of knowledge generation itself a vehicle for knowledge transfer rather than knowledge transfer through the end product (e.g. a report) only. The knowledge product and KTP should be sufficiently fitting both process and also policy needs.
- Social disconnection of both clients and suppliers (Badaracco, 1991, Landry et al., 1998, Choo, 1999, Stone et al., 2001): in intention the knowledge made should be readily useable on operational level. Both clients and suppliers should keep that in mind. New knowledge should eg encourage 'the public understanding of science" rather than remain abstract and un-understood. Both should be in continuous consideration to translate the new knowledge into an applicable form: what does sandgrain : sandgrain interaction mean for the costs of coastal maintenance. In addition the new knowledge is made from a supplier point of view with his/her opinions, beliefs, ideology, culture and history to be used in an environment with not necessarily the same opinions, beliefs, ideology, culture and history. Both supplier and client should realize that.
- Insufficient involvement of relevant stakeholders in the definition of the question (De Bruijn et al., 2003, Bots et al., 2002): sometimes powerful actors pose a research question from which the results will be applied in society. However, the question posed only represents their interest and not the interests of the stakeholders who "suffer" the impact of the results. Usually the results will not be applied because they are not accepted by society. How will the results be used in a societal context? And should those stakeholders influenced have access to the definition of the question? That are the important aspects to realize before tendering the research. *Nota bene*: this aspect influences the content of the question and alternatives under investigation.

Effective: process of knowledge use by an organisation

- No fit with prevailing domains of research relevance or policy paradigms (Twaalfhoven, 1999, Lomas, 2000, Stone et al., 2001): in general knowledge produced is not just a simple answer to a question but it fits into a broader pattern of broader socio-political, economical and cultural influence. It is part of/functions in view of a policy paradigm. In this sense the (potential) impact and influence should be considered in a long term perspective. How would one position that particular result in a flow of continuous process decision making.
- No acceptance by the stakeholders (Twaalfhoven, 1999, Van de Riet, 2003): such a process should have been organized that all relevant stakeholders accept the results so that (specific elaboration of the previous point, see also below: "Power and politics of control" and "No credibility of the research"). *Nota bene*: this aspect emphasis the procedural side of KTP.
- Political opposition (De Bruijn et al., 2003, Stone et al., 2001): Knowledge transfer

is not simply a matter of creating and disseminating knowledge. It is more important to value how knowledge produced fits into the policy paradigm valid for that moment. The degree of fit can determine whether an idea is selected or ignored. In this context it is important to realize that stakeholders can differ in the policy paradigm used. Stakeholders themselves decide whether they accepted new knowledge or not. Sometimes means like covenants, agreements and rules "how to play" can join opposing stakeholders in a new mutually accepted policy paradigm (see also "No credibility of the research" below).

- No [credibility] of the research (Stone et al., 2001): most research is funded some way making its independency questionable and thereby its credibility. "[Knowledge] is always for someone and for some purpose". This is a typical example of a political argument and use. Publishing in peer-reviewed scientific magazines may give some basis for independency but is not an assurance. Also the earlier mentioned covenants might prevent a political debate on validity and credibility.

Over viewing the list it ranges in each category from the more concrete level of actually producing and communicating the knowledge to the more abstract use in the larger context. In addition our criteria used in the initial phase (workshop and preliminary screening) do match with the gross list above.

5.2 What do we add with our template and do we match all aspects mentioned above with our template?

Knowledge transfer is an extensive field. The literature we have studied, ranges from communication of knowledge (eg Vlachos, 1972, 1978), knowledge management in organizations (like eg. Leonard-Barton, 1995 and Choo, 1998) to the use of knowledge in a political context (eg Twaalfhoven, 1999, Lomas, 2000, Stone et al., 2001). This extensive field also urges us to a disclaimer that the literature survey performed is limited but according to our opinion it does represent all major items and opinions across the field. The literature overview has illustrated several views and methods of framing a certain situation in which KTPs play a role. In this sense the overview has helped to improve and deepen our final template for evaluation.

In comparison to existing literature and methods of framing KTPs, we added/emphasized the importance of the organization (of the communication) of the interests of directly involved actors and other stakeholders to this gross list of success and failure factors. Our check list also seems complete. Those aspects which are manageable in the direct KTP are being addressed: the importance of the interests and cultural aspects of the client are specifically being addressed in the *section B. Organisation of the communication on knowledge need*. The gross list above stresses also the importance of the mutual aspect of generating the new knowledge by supplier and client together in such a manner that the client can validate and integrated the new knowledge in its own organization and culture. This is addressed in *section C "Organisation of the communication between client and supplier"*.

The final template for evaluation addresses those aspects that are relevant and manageable in the direct KTP between supplier and client. Some aspects are not addressed specifically in

the template like: what are those cultural aspects (in terms of beliefs, cultural knowledge [norms, criteria] and preferences) of the client that could enhance acceptance, effectiveness, applicability, incorporation and use of the knowledge. We believe, however these are implicitly taken into a well structured process. The client should organize a review process along the process of knowledge generation in which members of the client's organization participate. Those reviewers should be representing both the client's organizational culture as well as the prevailing policy paradigm. This is taken in to account as an analyst criterion to evaluate. Another aspect is the specific addressing of the criteria which a client uses to **decide** to apply the new knowledge. One could wonder if even the client has enough insight to determine it himself. In addition, the specialist knowledge is usually provided as a detailing and part of a larger set of data, information and aspects. The criteria to base a decision on are more at place at an over viewing, integrating paper.

Moment and form of dissemination are also not addressed by the final template for evaluation. This is for two reasons: firstly, the template has such an abstraction level that such detailing is inappropriate. To determine moment and form is so dependent on circumstances. Supplier and client should determine this aspects for themselves as part of the organisation of the process. Secondly moment and form of dissemination represent a new vast and extensive area of research: interesting but beyond the scope of this study.

Other aspects not explicitly addressed in the final template, are those that belong to the policy paradigm and political use. The fit to policy paradigm seems to be covered by a good organisation of the process between client, supplier and fit of the knowledge in the culture (≈ policy paradigm of the client). The political use is something that hardly seems to be manageable, something which was concluded in Chapters 2 and 3 as well. Matters like criticism on assumptions, which policy paradigm to use and political use of knowledge are difficult to deal with. A first step is to organize a process that suits and potentially satisfies all relevant stakeholders. Interests should be represented in the form of research questions, criteria, alternative options etc. (Van de Riet, 2003). Secondly one could formalize a new policy paradigm which all stakeholders accepted. E.g. all stakeholders could agree to a mutual covenant in which rules are negotiated (De Bruijn et al., 2003). This aspect is not dealt with in the template. According to our opinion, this is also beyond the scope of research (direct KTP between supplier and client) and beyond where any template (of evaluation) can function. This study and the final template do help to realize aspects like policy paradigms play a major role in the use of knowledge. The creation of a new policy paradigm between stakeholders is a matter of such complexity that it is difficult to frame. Again this aspect represents a new area of research.

5.3 How was the final template for evaluation received by the professional community of suppliers, mediators and clients?

The final template for evaluation was presented in a workshop. Here the functioning of the template was tested by using a role play in which a KTP had to be designed by participants. Each participant had some information but not all. The final template for evaluation was used as a guide and communication tool to retrieve all information necessary from all the participants to come to a adequate KTP.

The final template of analysis was received well by the workshop. In general all participants thought that in its present state it is a good tool to serve as a checklist in the end of an intake dialogue (*ex post* tool of analysis). It makes a number of aspects of the KTP explicit and in this way reminds the client and supplier to discuss those aspects. The opinions were divided whether the framework should be converted to a more guiding tool (*ex ante* tool of analysis). To achieve this, it would be advisable to change the order of the sections, eg the section on actor analysis could be placed as the first section. By this restructuring the framework would fit more with the normal procedure of I) intake; ii) detailing and iii) project organisation. In addition the questions could have a more open character. Another opinion was to leave the template as a checklist to be used in the end phase of the intake. A *ex ante* guideline would obstruct the use of common sense.

We do agree that common sense is a most important tool in designing KTP in the ever complex, ever changing public sector. However what we offer with our literature review and the final template for evaluation is some methods of framing a situation, some mirrors to increase insight in what is required at that moment. Taking the literature, cases and workshops into consideration, we add additional and useful insight in KTPs in the public sector. This insight is formalised into the final template for evaluation. We also think that the *ex post* final template for evaluation could probably be redesigned (altering order of questioning and constructing of sentences) that it can serve as an *ex ante* tool for intake.

5.4 An evaluation on KTPs in Dutch water management: KTPs in general and the cases specifically

We give an overview of KTPs using the four levels of use (scientifically valid, applicable, applied and effective). A compilation is given of the results of the workshops, literature and our findings in the cases.

KTPs in Dutch water management: valid

The participants of the first workshop (Bots et al., 2002) expressed clearly a high confidence in the quality and professionalism of the knowledge provided (in a Dutch context). They generally considered the knowledge produced being scientifically valid. This feature is confirmed by the study of Twaalfhoven (1999) who studied five cases of KTP done for the MINVenW (three directly water related, two of a logistic nature).

Van de Riet (2003) encountered more critical users. In all three studies examined, the researchers were considered capable. Most criticism was on the choice of assumptions. But does this belong to the level *Valid*? Van de Riet (2003) made a political analysis of the degree of satisfaction of stakeholders with the process of decision making in three cases of KTP done for the MINVenW (two directly water related, one of a logistic nature). Interpreting her findings, it is important to realize that assumptions are core issues of policy paradigms. So stakeholders from one policy paradigm will always question the assumptions of the other policy paradigm. This argument belongs more to the level *Applied* (see also the previous section 5.1). In addition one should be aware that the validity of research can be questioned for a political reason. An often used argument is the lack of independency of the suppliers towards the clients (Stone et al., 2001).

In our cases, the scientific validity was not questioned. Therefore it seems in general that the knowledge provided by suppliers for Dutch water management has a sufficiently high quality.

KTPs in Dutch water management: applicable

A major point of concern which makes knowledge applicable is sufficient understanding of the context of use. This item was emphatically mentioned in the two workshops (Bots et al., 2002,, section 2.3.1) and in other case studies (Twaalfhoven, 1999, van Koningsveld, 2003, Van de Riet, 2003). Also in all but two of our cases (the drinking water facilities and the guideline situations are exceptions, see also table 2.1), there was a tendency in the KTP to underestimate and serve less the context of the client and the context of use. So in general it seems that KTP in Dutch water management could pay more attention to the aspect of the context of the question (the question behind the question). We specifically stress the context of the question in our final template of analysis.

The use in political sense is a tricky one. Both Twaalfhoven (1999) and Van de Riet (2003) stressed the aspect of political use. How can one assure accurate and appropriate use of knowledge? But this is also an aspect of the levels *Applied* and *Effective*.

A second point mentioned for the Dutch situation to make knowledge more applicable, was the design of the (mutual) knowledge making (Twaalfhoven, 1999, Bots et al., 2002). The previous section gives enough information to improve it (ensure presence of some experienced people and a well designed process). Our template addresses this aspect, but does not urge to establish a more intense collaboration.

KTPs in Dutch water management: applied and effective

Some special attention should be give to “sense making in the client’s organization”. Neither of the workshops mentions this aspect, although it is a pronounced feature in literature (e.g. Choo, 1999, Stone et al., 2001). This aspect has some implications for KTPs. See 5.1.

Both literature (Twaalfhoven, 1999, Van de Riet, 2003) and the first workshop (Bots et al., 2002) mention the use of knowledge in societal and political context/use. These are two different aspects with two different remedies. To illustrate the first aspect: research results obtained by RWS showed that some polders in the province of Zeeland should be depoldered to improve safety and the quality of the water system of the Westerscheldt. The results could not be applied because the potential measures were not accepted by the local stakeholders. Both the results and especially the question did not serve their perception of safety and interests of preservation of land. In this case one can see that the question of research was posed by and serving only the interest of one stakeholder. Involvement of society in problem definition phase (open plan processes) is a major concern in recent watermanagement areas (Over stromen, 2000). The final template does not specifically address the relevance of the question itself. It does urge both supplier and client to (re)evaluate the potential use and impact of the results.

It is important to notice that the societal context is translated into a matter of content. **What** is the topic of research? In the case of the Westerscheldt: what do local stakeholders

perceive as their problem? Or: how would they like to solve the safety-problem? The political aspect (acceptance and use) is a matter of process (procedures). **How** do we deal with the results and with **whom**? This failure factor occurs in KTPs in Dutch watermanagement. Remedies have been formulated in sections 5.1 and 5.2. But even then both suppliers and clients can design such a good KTP or provide such good new knowledge, still it may not be used because it does not fit the political agenda. But than again, what would object reintroduction of old knowledge in a new form on a new better suiting moment (Landry et al., 1998; Stone et al., 2001)?

Concluding: KTPs in Dutch watermanagement in general, are reasonably well designed. The knowledge generated is of high quality (= valid). Given the complexity of the public sector, the knowledge is usually applicable although both supplier and client could be more aware that the question should be formulated with the appropriate context. An underestimated aspect of making knowledge applied is “sense making by the client’s organization”. This is mentioned in literature but not in the workshops. It seems underestimated/not recognized by suppliers and clients. By being aware of sense making, a client could emphatically discuss the new knowledge within his own organizational culture to position, integrate and apply the new knowledge more smoothly.

A special point of attention might be the contexts of use (societal and political). Both make new knowledge applied and effective. Both are large complex issues. The societal context will be made topic of research. The political context has been under investigations and some remedies have been suggested. But also in Dutch watermanagement, one cannot prevent that it is a stakeholder’s political choice to apply new knowledge or not (covenant or not).

6 Conclusion and recommendations

We have performed an extensive search into the success and failure factors of knowledge transfer from knowledge suppliers (like GTI's as WL | Delft Hydraulics.) to public clients dealing with water management (like RWS-DWW and RWS-RIKZ). During this search we used tools like discussions and workshops to mobilize the tacit experience of suppliers, knowledge mediators and clients, templates of analysis to analysis actual cases of knowledge transfer (by filling in the template through interviews) and explicit knowledge like literature review to refine our template of analysis, and interpret our results.

In general complex processes like KTP for the public sector cannot be completely and deterministically explained. They can be framed in a certain manner yielding insight in this manner. In this report three methods of framing are given: the first (chapter 3) discusses KTP from the point of view of noise in communication between a sender and a receiver and a synthesis with the specific characteristics of KTPs in policy and decision making. What causes noise in the communication in a KTP? And how can both client and supplier come to congruence and overcome the noise.

The final template for evaluation is an operationalisation of Chapter 3 in a tool that can be used to either analyse or design a KTP. Following the different questions and assignments yields insights in the KTP at hand.

The third method of framing is given in the discussion: here the scales of use (valid, applicable, applied, effective) are used to order failure factors from literature. The scales of use are connected to organisational units that will apply the new knowledge: from concrete data and supplier to use in a societal and political context. All methods of framing yield important insight in how a KTP can be designed.

6.1 General conclusions on KTP

Both in general KTPs and in KTP in Dutch watermanagement we can conclude that all parties involved (clients, supplier and related actors involved) should realize the following:

1. In general a knowledge gap has an interest not only for the client himself but also for stakeholders and actors related to the client. Therefore it is important that the communication of question is emphatically and consciously organized. It should be determined:
   1.1. Who has which interest (in terms of system implications or administrative consequences) in the answer yielded. Who will be affected by the implementation of the results?
   1.2. Did those actors have their impact and influence on the formulation of the question?
2. The client needs a process of sense-making in his own organization to accept and to decide to use the new knowledge. The sense–making can be stimulated by:
   2.1. a more conscious choice of participating in the knowledge generation
   2.2. organizing a review process along the process of knowledge generation in which members of the client's organization participate. Those reviewers should be

representing both the client's organizational culture, the deciding authorities as well as the prevailing policy paradigm.

3. Both client and supplier should realize that the ultimate use of knowledge is a political decision: some knowledge will not be used because it does not fit/suit the enduser, no matter how well designed the KTP was or how valuable the actual results
4. Both client and supplier should realize that both timing of release and form of dissemination (presentation) can increase the chance of use.
5. The template for analysis we have developed, helps in raising awareness that the above mentioned points are important. By filling in the questionnaire, both supplier and client can design a more appropriate KTP. In this manner they can take care that the question is answered with the appropriate context (interests of stakeholders and potential use in the process of decision making) considered, in a careful designed process (where the new knowledge is carefully embedded in the client's organisation).

6.2 Specific conclusions on KTPs in Dutch watermanagement

Above general conclusions are valid for the Dutch KTPs in watermanagement. KTPs in Dutch watermanagement are generally well designed. The knowledge generated is of high quality (=valid). Given the complexity of the public sector, the knowledge is usually applicable although both supplier and client could be more aware that the question should be formulated with the appropriate context. An underestimated aspect of making knowledge applied is "sense making by the client's organization". This is mentioned in literature but not in the workshops. It seems underestimated/not recognized by suppliers and clients. By being aware of sense making, a client could emphatically discuss the new knowledge within his own organizational culture to position, integrate and apply the new knowledge more smoothly. The political context makes new knowledge applied and effective. But also in Dutch watermanagement one cannot prevent that is a political choice to use new knowledge or not. Suppliers can only accept that.

6.3 Recommendations for further research

The term 'knowledge transfer' opens an enormous field of research ranging from the psychology of didactics to institutional learning. In our research we focused on the direct fit of the answer delivered and the applicability to fill the knowledge gap defined. Is the answer valid, applicable, applied and effective? First thing necessary to answer these questions is a tool for analysis. In this study we have generated a *ex post* template for evaluation: first to describe, then to interpret the organisation of the definition of the knowledge gap, the knowledge generation and –transfer between the person with the need (client) and the person with the abilities (supplier).

The analysis template can be used as a research tool to investigate the earlier mentioned fit between knowledge gap and answer delivered. Ideally the tool is applied in knowledge intensive environments like the Technical Science Institutes of the Dutch National institute for Watermanagement or the large centres for technological improvement (GTI's).

6.4 Plan for research

Coming period the final template of evaluation needs to be applied to various KTPs. The template is applicable for already answered knowledge questions (*ex post*) and for knowledge questions to be answered (*ex ante*). We see potentials to apply the template in large knowledge intensive organisations like the RWS-DWW, RWS-RIKZ and RWS-RIZA. In addition the template could be applied in projects that have a bridge function between the Delft Cluster and ICES-KIS 3. The template is especially suitable to design a research plan in those situations where somebody (preferably the public or market sector) is the knowledge client (see Table 2.1).

Research questions for ex post evaluation

The intention is to apply the template to various KTPs in a number of organisations. Questions of relevance:

- Within an organisation comparison: does an organisation have failures in KTPs? Is this each time due to a different failure factor or does the comparison of cases reveal a pattern?
- Between organisations: Comparing organisations, is there a bias between types of organisations and failure factors or do all organisations reveal the same pattern?

Research questions for ex ante evaluation

In general all participants of the final workshop thought that the final template in its present state it is a good tool to serve as a checklist in the end of an intake dialogue. Here it functions an *ex post* tool of evaluation for the intake. Positioned in the entire process, it still operates in the phase of problem definition: a potential *ex ante* tool to sharpen and crystallize the question of research. This leads to the following research questions:

Does the application of the final template for evaluation lead to an altering and sharpening of the question under investigation?

Can the final template be rephrased in such a manner that it can serve as a guidance tool of the intake and start up of a knowledge transaction rather than an evaluation of the intake?

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A Eerste voorlopige template voor evaluatie

A.1 Criteria voor KTP effectiviteit: niveau 1 (wetenschappelijk valide)

Deze criteria betreffen de vakinhoudelijke dimensie. De kwaliteit van de kennisoverdracht is goed wanneer de gegenereerde kennis inhoudelijk (wetenschappelijk) valide is en aansluit op de vraag 'in engere zin' zoals door de beleidsmaker gesteld*?*

Criteria voor KTP effectiviteit	**Wat kan mis gaan?**	**Illustratief voorbeeld**
1. Interpretatie van de vraag		
1a. is de vraagstelling ondubbelzinnig?	Begrippen zijn voor meer dan één uitleg vatbaar. Jargon!	Bijv. *kustafslag* wordt gebruikt terwijl *kusterosie* mogelijk wordt bedoeld (verschil structurele erosie en fluctuaties in kustlijn). Ook zou eigenlijk *economisch* i.p.v. *financieel* bedoeld kunnen worden.
1b. is interpretatie ondubbelzinnig?	Er is keuzevrijheid in interpretatie (bijv. betekenis van variabelen, normstelling en criteria)	Wat technisch en financieel haalbaar is hangt af van de specifieke randvoorwaarden van de klant. Moet het binnen zijn budget passen en hoe groot is die dan?
2. Vertaling vraag in onderzoekbare deelvragen		
2a. per deelvraag: is de deelvraag relevant?	Voor de relevantie van de deelvragen is inzicht in achterliggende vraag van opdrachtgever vaak noodzakelijk (zie voorbeeld).	Voor beantwoording vraag is onderzoek in zowel historisch gedrag als toekomstig gedrag mogelijk. Echter als de vraag voortkomt uit de achterliggende wetenschap dat t.g.v. een voorgenomen ingreep (bijv. uitbreiding maasvlakte) de hydraulische randvoorwaarden sterk zullen gaan veranderen is een historisch onderzoek minder relevant.
2b. volledigheid: dekken alle vragen de hoofdvraag?	Opdrachtnemers zijn geneigd deelvragen te formuleren die zij kunnen beantwoorden, terwijl andere vragen die wellicht relevanter zijn maar moeilijk of niet te onderzoeken worden weggelaten. Ook vragen die niet op het competentieterrein van de opdrachtnemer liggen zullen niet snel worden geformuleerd.	Als het onderzoek bij een technisch bureau wordt uitgezet zal er logischerwijs veel aandacht worden besteed aan de technische haalbaarheid, fysische processen e.d. De financiële (economische) haalbaarheid wordt dan veelal weinig aandacht gegeven.
2c. zijn aannamen en uitgangspunten voor alle deelvragen consistent?	Vooral als voor deelvragen verschillende modellen gebruikt gaan worden, die ieder andere uitgangspunten en aannamen kennen, is er een reëel gevaar van inconsistentie	Een fout zou kunnen zijn dat bij het onderzoek naar toekomstig gedrag uitgegaan wordt van louter historische uitgangspunten (waardoor bijv. versnelde

		zeespiegelstijging wordt vergeten)
3. Kennisinventarisatie: wordt state-of-the-art kennis gebruikt?		
3a. is er een goed sjabloon?	Bij routinematige vragen zal de opdrachtnemer veelal een sjabloon hebben. Bij complexe vraagstukken is dit veel minder het geval.	
3b. is er een goede theorie?	Er kan sprake zijn van verschillende theorieën die elkaar tegenspreken. Keuze hangt dan af van het instituut of soms de persoon binnen het instituut die de vraag moet beantwoorden. Soms bewuste keuze, soms toeval.	Voorbeeld: discussie over de versteiling van de vooroever langs NL kustgedeelten. Is deze significant en wat is betekenis ervan voor kustafslag?
3c. zijn er goede gegevens beschikbaar?	Veelal worden gegevens geleverd door de opdrachtgever. Een goede interpretatie van de waarde van deze data ontbreekt nogal eens, bijv. door onvoldoende (veld)ervaring van de opdrachtnemer.	Voor kustgedrag is een goede database beschikbaar (JARKUS). Dit bestand geeft echter onvoldoende inzicht in seizoensverschillen, die voor kust*afslag* juist belangrijk zijn.
4. Keuze van het model		
4a. sluit het model aan op deelvraag?	Modellen zijn altijd een vereenvoudiging van de werkelijkheid. Omdat er vaak neiging is tot kwantificeren worden modellen snel gebruikt, ook als deze niet helemaal geschikt zijn.	Kustafslag modellen zijn vaak profielmodellen die geen rekening kunnen houden met langsvariabiliteit
4b. voldoet probleemsituatie aan randvoorwaarden/aannamen voor model?	Om deze vraag goed te beantwoorden is inzicht nodig in domein waarbinnen model toegepast mag worden. Bij complexe 'nieuwe' vraagstukken kan niet worden geput uit bewezen ervaringen uit het verleden.	Wanneer een morfologisch model gebruikt wordt met jaargemiddelde hydraulische randvoorwaarden, dan kan daar nooit een seizoensmatige variatie uit voorspeld worden.
4c. is het 'beste' model gekozen? ?	Modelkeuze wordt vooral bepaald door beschikbaarheid modellen bij opdrachtnemer, kosten, beschikbaarheid data en gewenste nauwkeurigheid. Dit laatste dient met klant te worden bepaald. Is zoeken naar optimum (nauwkeurigheid versus kosten). Soms wordt ten onrechte een grote nauwkeurigheid nagestreefd terwijl dat zinloos is gezien andere gerelateerde onzekerheden.	Stel dat kustgedrag met meest comprehensive model wordt onderzocht (bijv. 3D model). Vervolgens blijkt de klant vooral geïnteresseerd in de globale gevolgen van een groot aantal verschillende zeespiegelstijging-scenario's, die ook met een eenvoudige formule (bijv. de Bruun rule) gegenereerd hadden kunnen worden.
5 Modelontwikkeling (optioneel)		
5a. sluit nieuw model aan op 4a en 4b?	Modelontwikkeling is afhankelijk van aanwezige kennis omtrent nieuwe ontwikkelingen in vakgebied. Deze kan bij opdrachtnemer onvoldoende zijn. Ook komt het voor dat er te veel wordt ontwikkeld vanuit de wetenschappelijke nieuwsgierigheid waardoor zicht op de praktijk wordt verloren.	Soms wordt aangeboden een nieuw of verbeterd model toe te passen, terwijl onvoldoende bekend is of dit wel tot het gewenste resultaat leidt.
5b. verificatie	Vaak betreft modelontwikkeling het toevoegen van processen c.q. softwareroutines aan bestaande modellen. Dan wordt er een nieuwe versie opgeleverd. Als er geen goed	Er is soms geen aandacht voor verificatie aan eerdere resultaten waardoor een nieuw model slechts in een beperkt bereik verbeteringen geeft.

	versiebeheer is kan dat leiden tot problemen in de toepassing.	
6 Model operationalisatie		
6a. sluit modelschematisatie aan bij eisen nauwkeurigheid?	Bij keuze van bijv. modelgrids (modelgrenzen, detailniveau, al dan niet curvilineair of bolvormig) spelen veel factoren een rol (o.m. rekensnelheid, inperking interessegebied, databeschikbaarheid e.d.). 'Verkeerde' beslissingen kunnen leiden tot significante randeffecten of het niet goed kunnen schematiseren van nieuwe maatregelen.	
6b. sluiten calibratieresultaten aan bij eisen nauwkeurigheid?	Bij calibratie zal vaak 'op het oog' beslist worden of ze goed genoeg zijn. Expliciete criteria hiervoor ontbreken nogal eens.	Is de calibratie te bereiken zonder probleemspecifieke parameterinstellingen?
6c. sluiten validatieresultaten aan bij eisen nauwkeurigheid?	Validatie vereist een goede set onafhankelijke data. Validatie wordt nogal eens overgeslagen bij routinematig gebruik van modellen ('bewezen' validatie uit verleden)	
7. Analyse met behulp van model		
7a. sluiten gekozen scenario's en strategieën c.q. maatregelen aan op vraagstelling?	Keuze van te beschouwen maatregelen wordt vaak door opdrachtgever gegeven. Als hierin een zekere vrijheid is, hangt het af van de opdrachtnemer hoe creatief deze is. Soms is er sprake van onuitgesproken taboes op bepaalde oplossingen.	Er is in NL nagenoeg geen ervaring met 'detached breakwaters' Deze maatregel zal derhalve meestal niet onderzocht worden.
7b. zijn voldoende modelruns gemaakt?	Aan het aantal modelruns hangt vaak een prijskaartje. Wordt soms expliciet door opdrachtgever aangegeven.	
8 Interpretatie van de resultaten		
8a. onzekerheidsmarges, significantie van uitkomsten	Klanten houden niet van onzekerheid. Het benadrukken van de onzekerheidsmarges zal ook bij de opdrachtnemer niet voorop staan. Het stelt nl. 'zijn' model ter discussie. Bij een complex probleem met een serie modellen is het ook niet altijd mogelijk de opeenstapeling van onzekerheden te kwantificeren.	Een grote onzekerheid bij toekomstige kustafslag is de stochasticiteit van de weersomstandigheden. Het is daarom moeilijk om garanties te geven dat bij een bepaalde maatregel geen kustafslag meer voor zal kunnen komen. E zijn nu eenmaal grenzen aan de voorspelbaarheid.
8b. worden uitkomsten getoetst aan normen of criteria?	Als opdrachtgever expliciet normen en criteria heeft gegeven, zal de opdrachtnemer deze meestal wel gebruiken. Het komt vaak voor dat deze te weinig expliciet of kwantitatief zijn. Dan zal de opdrachtnemer deze moeten vertalen om ze vergelijkbaar te maken met de modelresultaten. Gebrekkige communicatie kan in dit stadium leiden tot verkeerde uitspraken.	Wanneer is een calibratie betrouwbaar? Dit is vaak niet vastgelegd.
8c. worden normatieve uitspraken gedaan zonder dat	Dit kan voorkomen wanneer de opdrachtnemer het gevoel heeft dat deze	Wanneer de opdrachtgever niet heeft gespecificeerd wat de term

daar expliciet om gevraagd wordt?	een belangrijke conclusie op het spoor is, maar 'formeel' niet kwijt kan. Om het belang van zijn/haar onderzoek te onderstrepen kan hij/zij op basis van eigen inzichten gaan zoeken naar referenties, die niet altijd overeenkomen met die van de opdrachtgever.	'financieel haalbaar' is inhoud, kan de onderzoeker gebruik maken van zijn/haar eigen referentiekader, bijv. 10 miljoen op jaarbasis is wel erg veel voor één kustvak, gezien het jaarlijkse budget voor de hele NL kust. Hij/zij kan daarbij de plank misslaan als deze geen inzicht heeft in het financiële beleid van de opdrachtgever.
9 Rapportage aan de opdrachtgever		
9a. wordt verslag gedaan van de werkwijze?	Zelden zullen alle stappen in extenso in de verslaglegging worden weergegeven. Vaak zal verwezen worden naar literatuur of modelbeschrijvingen (manuals) om de rapportage niet te lang te maken. Dit impliceert dat deze informatie toegankelijk moet zijn bij de opdrachtgever. Afgezien dat dit niet altijd het geval is, zal dit bij een bredere verspreiding van het rapport zo mogelijk een nog groter probleem zijn.	
9b. is de rapportage consistent met de uitkomsten van deze stappen?	Het ontbreken van een goed review-systeem kan leiden tot inconsistenties. Review van rapporten door experts gebeurt meestal door collega's waardoor meestal inconsistenties vroegtijdig worden gesignaleerd.	
9c. Is de rapportage helder?	Hier kan het nogal eens aan ontbreken doordat de onderzoeker veelal schrijft vanuit zijn/haar eigen denkkader en niet vanuit degene voor wie het rapport uiteindelijk is bedoeld. Review-procedures kunnen hier slechts gedeeltelijk soelaas bieden (reviewers kijken vooral naar inhoud en niet naar vorm). Meestal ontbreekt een echte redactionele slag.	
9d. geeft de rapportage expliciet antwoord op de vragen?	Het gaat hier vooral om het kort en bondig verwoorden wat in alle voorgaande stappen expliciet of impliciet is gedaan. Dit vereist zowel een goede inhoudelijke als redactionele vaardigheid. Met name deze laatste ontbreekt nogal eens (zie 9c.). Het probleem is vaak dat de conclusies te lang zijn (om alle mitsen en maren van de werkwijze weer te geven, vanuit een gevoel van accountability) waardoor het antwoord op de vraag niet helder wordt) of te kort (de klant wil een duidelijk antwoord, dus dan moeten alle randvoorwaarden, keuzes e.d. maar tot details worden gedegradeerd).	

A.2 Criteria voor KTP effectiveness at Level 2 (bruikbaar, beleidsrelevant)

Niveau 2

Deze criteria betreffen de praktische bruikbaarheid van de onderzoeksresultaten (de aangeleverde kennis). De kwaliteit van de kennisoverdracht is goed wanneer de overgedragen kennis voorziet in de *werkelijke* kennisbehoefte van de beleidsmaker. De kennis (bijv. het gebouwde model of DSS) is van dien aard dat zij de beleidsmaker inzicht verschaft in (de effecten van) verschillende autonome ontwikkelingen en/of beleidsopties. Niveau 2 veronderstelt kwaliteit op niveau 1 (de kennis moet kloppen en de concepten moeten door de beleidsmaker worden begrepen), maar gaat verder in de zin dat de beleidsmaker 'verder kan' (lees: keuzes kan maken) op basis van de aangeleverde kennis.

Criteria voor kwaliteit van kennisoverdracht	**wat kan er mis gaan?**	**Voorbeelden**
1. is het doel van de onderzoeksvraag voldoende geëxpliciteerd		
1a. is er een volledige probleembeschrijving?	er is geen probleembeschrijving of deze is onvolledig	
1b. past de onderzoeksvraag logisch in de probleembeschrijving?	Onderzoeksvraag past niet (geheel) logisch in probleembeschrijving. Opdrachtnemer kan dit signaleren, kan leiden tot aanpassing van onderzoeksvraag, maar ook tot niet verkrijgen van opdracht. Procedure in offertestadium biedt niet altijd de mogelijkheid tot dergelijke aanpassingen (tijdsdruk/concurrentie/geheime agenda's e.d.)	
1c. is het nut (de bijdrage aan besluitvorming) van het onderzoek voldoende duidelijk?	Soms kan onderzoek worden uitgezet dat wel bijdraagt tot probleemoplossing, maar niet de echte knelpunten oplost. Soms wordt dit bewust gedaan om aandacht af te leiden van echte/moeilijk oplosbare/pijnlijke keuzen.	
1d. Is de verwachting dat resultaten bij kunnen dragen aan oplossing groter probleem?	Soms is het onderzoek logisch en nuttig, maar is het twijfelachtig of er wel goede resultaten te verwachten zijn (bijv. omdat eisen aan o.z. gesteld worden die met huidige wetenschap niet haalbaar zijn)	
1e. Is er voldoende afstemming met ander onderzoek?	Soms kan het onderzoek overlappen met ander onderzoek, of soms is onderzoek pas nuttig als ander onderzoek ook plaats vindt. Zicht op de hele keten van onderzoeksvragen is dan nodig (maar niet altijd aanwezig).	
1f. Is er voldoende samengewerkt met ander onderzoek?	Vooral belangrijk als verschillend onderzoek van elkaar afhankelijk is.	

	Problemen kunnen zich op vele terreinen voordoen in de samenwerking (bijv. timing van onderzoek, problemen met verschillende methoden, verschillende cultuur van onderzoeksbureaus, concurrentie tussen bureaus e.d.)	
2. is het onderzoek compatibel met ander onderzoek?		
2a. zijn aannames die aan verschillende onderzoeken ten grondslag liggen consistent?	Spreken de methodes van (wederzijds) afhankelijke onderzoeken elkaar niet tegen?	
2b. sluiten de omgevingsvariabelen van modellen goed aan op uitvoervariabelen van andere modellen (en *vice versa*)?	Spreken de methodes van (wederzijds) afhankelijke onderzoeken elkaar niet tegen?	
2c. voegt het onderzoek substantiële kennis toe aan eerder onderzoek?	Wat is nieuw aan het uitgevoerde onderzoek?	
3. Is er voldoende rekening gehouden met aanpalende probleemvelden?		
3a. is bij het onderzoek rekening gehouden met gevolgen van beslissingen elders (bijv. veranderingen in spuiregime Haringvliet)?		
3b. biedt het onderzoek zicht op de consequenties van door de opdrachtgever te nemen beslissingen op die van anderen?	Wat zouden de consequenties zijn als men zou handelen naar de resultaten van dit onderzoek?	
4. Is de rol van de cliënt voldoende duidelijk?		
4a. Is er voldoende zicht op de beheerscascade?	De beheerscascade kan heel ingewikkeld zijn en in de tijd dynamisch (verandering van verantwoordelijkheden, verschuivende prioriteiten, e.d.)	
4b. Past de rol van de opdrachtgever formeel/inhoudelijk in de beheerscascade?	Formeel: opdrachtgever heeft wel/geen formele positie in besluitvormingstraject Inhoudelijk: opdrachtgever heeft wel/geen goede kennis van zaken	
4c. Is er zicht op andere actoren in de beheerscascade (ook informeel)?	Opdrachtgever kan om welke reden dan ook het zicht op andere actoren bewust dan wel onbewust niet geven	
4d. Heeft er afstemming/overleg plaatsgevonden met deze andere actoren?	Opdrachtnemer zal het meestal niet tot zijn/haar taak zien om deze afstemming te bewerkstelligen. Opdrachtgever wordt niet altijd door andere actoren als gelijkwaardige partner gezien.	

B Case Description

We applied our initial template to the large applied research programme considering the Port of Rotterdam, a case on drinking water management, a guideline situation (guidelines sandy coasts) and one special case of fundamental research (COAST3D).

Advice and applied research situations: research programme the Port of Rotterdam: SM2V

In 1997 the Dutch cabinet decided that a solution had to be found for the increasing lack of space in the port of Rotterdam. In addition there was an increasing need to improve the quality of the social environment by increasing natural or recreational qualities. There too it was decide to start a Planological (basis) decision -procedure (PKB) together with a required Environmental Impact assessment (EIA) under the responsibility of the organisation Project Mainport Rotterdam (PMR). PMR is searching in three potential directions for solutions:

- a more efficient use of the space available in the port of Rotterdam
- a more efficient use of existing and planned industrial - and harbourfacilities in the areas south west of Rotterdam.
- an artificial peninsula (artificial peninsula Maasvlakte 2, MV2) attached to the already existing artificial peninsula Maasvlakte 1 (MV1) together with connected facilities for nature and recreation. The research for design and construct and the EIAs of all potential designs was co-ordinated and performed by Corporation Meuse peninsula 2. (SM2V).

We have chosen the large research programme of SM2V for our investigation for knowledge transfer because its large scale. It contains a large range of knowledge transfer situations ranging from almost fundamental research to direct advise and learning. In addition we included a special and typical situation of the “manual of soft coasts”. Here, not clearly defined principles of policy and management are translated into factual guidelines by knowledge exchange amongst scientists and area-managers. The different cases and their learning point will be described below.

B.1 Case 1 advise/applied research long term predictions on the development of the morphology of the mouth of the Haringvliet

ROUGH PROBLEM DEFINITION

It is to be expected that both the construction of an artificial peninsula and the semi permanent reopening of the reopening of the Haringvliet sluices will change the morphology of the mouth of the Haringvliet. The purpose of the study was to give predictions for the morphological development of the mouth of the Haringvliet estuary for six different designs of the industrial peninsula (a matrix of three different peninsula forms and two different strategies of water management for the sluices in the Haringvliet-dam. The predictions were to be given on a time course of 20, 50 en 100 years. Special attention was given to the uncertainties and (un)reliability of the prediction.

STAKEHOLDERS:
SM2V, PMR, Dutch governmental institutions (predominantly represented by the department of Traffic and watermanagement), Municipal Port Administration of Rotterdam.

EVALUATION OF THE KTP AND INSPIRATION FOR THE FINAL TEMPLATE
The study yielded two products: a methodology and an EIA for the aspect of morphology. In case of the first product clients and suppliers were both satisfied. The second product gained less appraisal. The results were presented in the form of maps whereas the client had the need to receive tables with figures. In addition every stakeholders judged that the position of morphological units were more accurately predicted than their size/surface area. One of the suppliers claimed that if they had known that surface areas were needed for the ecological impact assessment, he would have used a model calculation that was known to accurately predict surface area, but would have failed to predict the exact position (which is less relevant for biology).
INSPIRATION POINT: We analysed that the question had not been posed in its full context. Therefore we structured the final template for evaluation in such a way that both client and supplier were forced to think about potential extra users and the implications for question and answer.

B.2 Case 2, advise: Safety aspects of MV2 on the coast of Voorne and Goeree

PROBLEM DEFINITION
The construction of MV2 could lead to a change of safety for the islands of Voorne and Goeree. The directorate of South-Holland (DZH) of the Directorate-General of public works and water management (RWS) (RWS-DZH) had ordered a report on the change in impact of waves on the dunes of Voorne and Goeree due to MV2, in relation the safety against flooding of these island. This report was produced by the Directorate of road- and waterwayconstruction (RWS-DWW). RWS-DZH requested a verification and approval of this report from the Technical committee of advise for Watersheds (TAW). The study was performed by reading the report of RWS-DWW to assess the quality of the report. Attention was paid to the applicability of the models used and on the correctness of the used boundary data.

STAKEHOLDERS
RWS-DZH, PMR, decision makers like cabinet and Municipality of Rotterdam, the Waterboards of Voorne and Goeree (these Waterboards are responsible for the strength of the dunes, and these actors will eventually come with (financial) claims in case the MV2 has a negative effect on safety).

EVALUATION OF THE KTP AND INSPIRATION FOR THE FINAL TEMPLATE
This study can be judged in several ways. The direct client (RWS-DZH) was very satisfied. They could make their decision. However, TAW was not so satisfied. They had not been aware that the Waterboards were involved and were potential readers and users of the report. The Waterboards received the information and did not react properly. The information provided to the Waterboards was not followed-up. It proved that they did not realise the importance of the information provided.

INSPIRATION: We analysed that the total actor- and stakeholders context was not clear during this study. Had it been more clear probably the message would have been formulated in such a way that the Waterboards had realised to take propitiate action. Therefore we integrated a number of question to clarify the total realm of stakeholders involved.

B.3 Case 3, advise: Reopening of the lake of Oostvoorne: a quickscan

PROBLEM DEFINITION
In order to increase natural and recreational possibilities of the environment of Rotterdam, it was suggested to reconnect the Lake of Oostvoorne to the sea. This would yield and new intertidal basin with a saline gradient. It could also serve as an compensation measure for the loss of shallow sea. The study was performed according to the "Quick scan" methodology of PMR:

1. Definition of several connection designs by SM2V
2. EIA of those different designs as compared to autonomous development
3. Estimation of the costs
4. Concept report which is judged and approved by broad multidisciplinary panel of experts
5. Adaptation and formulation of the end report.
6. The study was done by PMR itself. The client was SM2V

STAKEHOLDERS
SM2V and PMR were client. The National institute of coastal and marine management (RWS-RIKZ) delivered the project coordinator. RWS-RIKZ was interested in the designs as potential solutions for the storage of sludge from the port of Rotterdam.

EVALUATION OF THE KTP AND INSPIRATION FOR THE FINAL TEMPLATE
The project was arranged as a "quick scan" with it drawbacks of not enough time. It was judged to be successful because the data available were actual enough, the composition of the group of people was both sufficiently multidisciplinary, and experienced. In addition, the contributors represented a large easily accessible network of other experts and disciplines. From the start the multidisciplinary question was approved by a multidisciplinary advisoryboard. The supplier received a multidisciplinary question which was answered also to its full multidisciplinary extend. We can add that one of the clients was involved in answering the question so the supplier was completely aware of the needs (an advise) of the client.
INSPIRATION POINT: We observed that the supplier was fully aware that they needed to deliver an advise rather than an EIA. Therefore we structured the final template for evaluation in such a way that both client and supplier were forced to think about the potential use of the answer.

B.4 Case 4 advise: management of drinking water facilities for Southwest Netherlands

PROBLEM DEFINITION
The RWS-DZH is responsible for the supply of sufficient fresh water to the region of Southwest Netherlands. Recently, a number of threats had been defined which could all

diminish this supply. The RWS-DZH was interested in a definition of potential problems and solutions. As a first step it wanted to locate all relevant stakeholders involved in the drinking water facilities. in short the purpose of the actor analysis was:

- obtain insight in all actors involved in the drinking water facilities. to what extent do they experience a problem in drinking water supply. Which role do they define for themselves to have a certain responsibility in co-operating on potential solutions.
- come to a commonly accepted problem definition by all relevant parties
- come to an agreement for an initial plan and program-organisation to solve the problem.

In the first phase of the research a number of interviews was held with fourteen actors. In the second phase the interview results were presented in two workshops. These workshops were also used to define the problem and a project organisation.

STAKEHOLDERS
Two clients were prominent: RWS-DZH and the Province of South-Holland (PZH). In addition the local Waterboards had a large interest in the results. The supplier was Resource analysis.

EVALUATION OF THE KTP AND INSPIRATION FOR THE FINAL TEMPLATE
First it should be mentioned that this project was not meant for generation of knowledge. In a way it was more meant to retrieve the information available and generate a commonly accepted plan of action and a project organisation (= knowledge management). Initially the supplier had the impression the purpose of the project was to generate knowledge: somehow the question was not posed correctly. But because of a high involvement of the client the original interpretation of the assignment was corrected to a more preferred one.
INSPIRATION POINT: this has shown us the at the process and development of a project during time are essential to monitor and analyse in order to have a thorough design of a situation knowledge transfer.

B.5 Case 5, guidelines: Guidelines sandy coast

PROBLEM DEFINITION
The guidelines “Sandy Coast” has been produced in 1995 on initiative in 1988 of TAW (Technical Advisory Committee for Flood Defence Works). In about 1990, the law-proposal on Flood Defence Works and in particular the revised proposal of this law in 1994 have been discussed in parliament (approved in 1996), resulted in decentralisation of responsibilities of operational managers of the primary flood defence works in the Netherlands. The de-centralised authorities can operate on the basis of their own vision on operation, own criteria and operational management methods. The objective of the government is that the safety and the sustainable functions and values in the area have to be maintained. Cooperation between the central government, provinces and the water boards are crucial for an adequate management of erosion processes along the coast. The initiative for the guidelines was undertaken to help to formulate visions, criteria and methods for optimal operational management tasks for maintaining of the safety and the relation to other public and social functions in the coastal area, in such a way that everybody agrees with the result.

STAKEHOLDERS
TAW - "Technische Adviescommissie voor de Waterkeringen" - Technical Advisory Committee for Flood Protection Structures is the advisory board to the minister of

Transport, Public Works and Water Management. The stakeholders related to the TAW-organisation are:

- The *Netherlands Parliament* advised by the Minister of Transport, Public Works and Water Management, is advised by TAW. In this sense they are an indirect client of the knowledge client.
- *Waterboards* being the implementers as Flood defence works managers, contributions to chapters on the sandy coast and the social framework,
- *Institutes of the Directorate General of Public Works and Water Management* of the Ministry of Transport, Public Works and Water Management: RWS-RIKZ, and RWS-DWW with contributions to the chapters on the sandy coast and the social framework, landscape, nature, and cultural values, and vegetation of the dunes.
- *Provinces* as co-ordinator and developer of regional policy plans in the area of flood defence, recreation, nature, landscape and physical planning,
- *Municipalities* on which territory implementation of plans takes place, not represented in the committee,
- *Universities*, Delft University of Technology, faculty of civil engineering-section Hydraulic Engineering, the University of Utrecht and International Institute for Infrastructural, Hydraulic, and Environmental Engineering (IHE) Delft with contributions to the guidelines and the basic report,
- *Large Technological Research Institutes*, such as GeoDelft and WL | Delft Hydraulics, do research by means of basic and specific subsidies from the government, and the result of these research programs are supposed to be sufficient to supply the knowledge necessary for the TAW publications in general and guidelines in particular.

EVALUATION OF THE KTP AND INSPIRATION FOR THE FINAL TEMPLATE

From both client and supplier point of view, this project was a success. In the beginning the wishes and interests of the actors were not exactly the same. There was agreement on the compilation of existing knowledge in the guidelines. However what should be written was not yet clear. In addition some details had to be resolved. Feed back with the home basis' of the various participating organisations, together being the knowledge client, had to take place many times. Discussion in the project group and in the involved organizations of stakeholders like the provinces and the waterboards caused delays but in the end the results were reasonable satisfactory for all stakeholders (as was the major factor for determining the success).

The involved parties (potential users) had emphatically access to define the question. In fact, for a great deal they were represented in both client and supplier. Important in the process was that stakeholders were engaged in the definition of the content. This cyclic process of definition took a long time. One should wander whether this long period is a disadvantage, because the nature of the product (consensus rather than the guidelines themselves) demands time.

INSPIRATION: The actor context is important. But each KTP demands its own interaction process organisation.

B.6 Case 6, fundamental research: COAST3D

PROBLEM DEFINITION

This is a special case not involved with PMR or SM2V. COAST3D was a typical science driven project. The majority of the project participants were science-oriented institutes

(universities and hydraulic laboratories). The project entailed modelling and fieldwork of the morphology of the coast. To facilitate communication and co-ordination the project had established a limited hierarchical structure. It was controlled by a steering committee under supervision of the project co-ordinator. Considering the topics to be covered by the project three sub committees were formed: the modellers group, the experimenters group and the coastal zone management (CZM) tools group. The modellers made up the bulk of the projects personnel followed respectively by the fieldworkers and the end users (CZM-group).
The first objective of the project was to increase the system knowledge and use it to improve present models of coastal behaviour. A secondary product of the project is the development of guidelines for the use of the developed products as CZM problem solving tools. The development of these guidelines is the responsibility of the CZM Tools group.

STAKEHOLDERS
Especially the main participants in the CZM tools group could be considered stakeholders (clients): RWS and the British Environment agency (EA). The suppliers were WL | Delft Hydraulics (NL), University of Utrecht Dept. Phys.Geog. (NL), HR | Wallingford (UK), University of Plymouth (UK), University of Liverpool (UK), Proudman Oceanographic Laboratory (UK), Universite de Caen (FR), CIIRC Universitat Politecnica De Catalunya (ES), Magelas BVBA (BE).

EVALUATION OF THE KTP AND INSPIRATION FOR THE FINAL TEMPLATE
From a supplier point of view, this project was a success. A number of peer reviewed scientific publications was one of the results. The clients were less satisfied. The formulation of guidelines for the use of COAST3D project results as CZM problem solving tools proved to be a tough problem. The CZM tools group faced the challenge of developing an approach to this problem. For the production of CZM guidelines there was only an imaginary client (role assumed by RIKZ and EA). There was hardly any pressure to formulate guidelines for the suppliers to structure their results during the project. From the beginning it was the intention to formulate them at the very end of the project. By then, the valid supplier results were not adaptable to make them useful, let alone used and effective.
INSPIRATION: this case taught us that the final template for evaluation should also be applicable in an early stage of a knowledge transfer situation (ex ante). Ideally the final template for evaluation helps in defining a set of do's and don'ts for each of the actor roles (or clusters of roles), perhaps even differentiated further to different situations (consulting, guideline, research-driven).

C Strategie van interviewen

Het stappenplan is gemaakt om te bevorderen dat de verschillende onderzoekers in het project in hun uiteenlopende gevalstudies en interviews zoveel mogelijk een uniforme structuur hanteren die integratie en interpretatie van de resultaten als geheel bevorderd.

C.1 Voorbereiding

De voorbereiding bestond in hoofdzaak uit documentanalyse. Onderzoeksopdracht, eindrapportage en publicaties rondom het onderzoek werden bestudeerd. Indien aanwezig werd ook de publiciteit naar aanleiding van het onderzoek bestudeerd om een indruk te krijgen van de context of the studie. Op grond van de documentanalyse werd een kenschets van de casus gemaakt (richtlijn 2 tot 3 pagina's). Deze kenschets omvatte de volgende vier onderdelen:

1. *Basiskenmerken*: in elk geval moet worden geëxpliciteerd wie de opdrachtgever was, wie bij het onderzoek als uitvoerder betrokken waren, welke tijdsperiode het onderzoek besloeg en wat het budget was.
2. *Globale probleemschets:* hierin worden op passende wijze de betrokken actoren en hun doelen en belangen geschetst. Het is zaak dat deze probleemschets de lezer een goede indruk geeft van de aanleiding en achtergrond van de onderzoeksopdracht.
3. *Globale schets van het onderzoek:* deze moet duidelijk maken welke onderzoeksvragen centraal stonden, het type onderzoek dat is gedaan, en het soort resultaten dat dit onderzoek heeft opgeleverd.
4. *Indicatie van gebruik/toepassing:* aan het eind van de casusbeschrijving moet enige aandacht gegeven worden aan de wijze waarop met de onderzoeksresultaten is omgegaan. Dit uiteraard voorzover de documentatie daar inzicht geeft.

C.2 Selectie van de te interviewen personen

Op grond van de in de vorige stap uitgevoerde documentanalyse werd een lijst opgesteld van betrokken partijen, waarbij zoveel mogelijk namen van individuen worden opgenomen. Uit deze lijst werden zowel representatieve vertegenwoordigers van de opdrachtgever (bij voorkeur de projectleider die de opdrachtverlening heeft ondertekend) als van de opdrachtnemer (bij voorkeur de projectleider van het onderzoek) gekozen.

C.3 Interviews

De gesprekken met individuen hadden ten doel de volgende aspecten te achterhalen:

- validatie van de kenschets van de casus (basiskenmerken, probleemschets, schets van het onderzoek en het vervolgtraject);
- Algehele indruk van het KTP
- zicht op de "vraag achter de vraag" (wordt die voldoende door de probleemschets weergegeven?);
- zicht op overige relevante personen voorzover die niet al in de vorige stappen zijn geïdentificeerd;

- zicht op kwaliteit van kennisoverdracht en achterliggende oorzaken en/of verklaringen daarvoor (het invullen van de “initial template”).

Zowel de kenschets van de casus als de lijst met kwaliteitscriteria voor kennisoverdracht werden gebruikt als leidraad voor het gesprek.

In geval het gesprek gevoerd werd met een *cliënt,* werden *eerst* de criteria op niveau 2 en dan pas die van niveau 1 bediscussieerd. In geval het gesprek gevoerd werd met een *supplier,* werden *eerst* de criteria op niveau 1 en dan pas die van niveau 2 bediscussieerd. Met andere woorden, het expertise gebied de van de betrokken personen was taken als uitgangspunt. Het slot van het gesprek was gebruikt om na te gaan of en in hoeverre de opdrachtgever de onderzoeksresultaten heeft overgenomen en uitgedragen (niveau 3) en of en in hoeverre ze het beleidsveld hebben beïnvloed.

Op grond van de gesprekken met de cliënt en de onderzoeksleider of the supplier, werd de shortlist met andere interessante gesprekspartners aangevuld, waarna 2 tot 4 aanvullende interviews worden gehouden. Deze extra interviews leiden tot beter inzicht in zowel het procesverloop als de inhoud van het onderzoek. Er werd gestreefd naar een gelijke verdeling van gezichtspunten.

C.4 Verslaglegging en interpretatie van de bevindingen

De interviews werd vastgelegd in een rapport. De cases werden door de interviewers geïnterpreteerd en op het meest geaggregeerde niveau werden richtlijnen en conclusies getrokken over het feitelijk bestudeerde KTP en over het functioneren van de “initial template”.

D KTP rollenspel[6]

D.1 Algemene informatie

De kennisoverdrachtsituatie die als achtergrond dient voor de toepassing van de *template* is de volgende:

Een offshore exploratiemaatschappij wil beter inzicht krijgen in de slijtage die optreedt aan haar offshore installaties als gevolg van zeebewegingen. In het bijzonder ontbreekt het de offshore exploratiemaatschappij aan kennis over stromingen en golven in de zeegebieden waarin haar installaties zich bevinden. Om in deze kennisbehoefte te voorzien wordt een waterloopkundig adviesbureau benaderd.

We volstaan met deze zeer summiere omschrijving omdat deze exercitie is bedoeld om na te gaan in hoeverre de *template*, die in het kader van het project "Kennisoverdracht: een kwestie van communicatie?" is ontwikkeld, een bruikbaar instrument vormt voor het analyseren, evalueren en ontwerpen van kennisoverdracht processen. Door drie ronden van een eenvoudige spelsimulatie in een klein uur te doorlopen ontstaat naar verwachting een goed beeld van hoe *template* moet worden gehanteerd en tot welke inzichten dit leidt. De rondes in het spel corresponderen met de drie hoofdonderdelen van de *template*.

1: De hoofdrolspelers in de simulatie zijn de projectleider van de offshore exploratie-maatschappij OSEC International en de projectleider van het waterloopkundig adviesbureau HYDRA. Zij moeten samen de *template* doorlopen. Door de daarin aangegeven opdrachten uit te voeren moeten ze tot een duidelijke specificatie komen van de benodigde kennisoverdracht en het daarvoor geschikte kennisoverdrachtproces. De overige spelers (hun rol blijft in eerste instantie onbekend) hebben in de eerste ronde van de spelsimulatie geen actieve inbreng. Hun taak is dan de twee hoofdrolspelers te observeren terwijl die de eerste fase van de *template* doorlopen. Dit eerste deel correspondeert met de eerste fase (*intake*) van een kennisoverdrachtproces en duurt maximaal 15 minuten.
Zodra de twee projectleiders het eerste deel van de *template* hebben afgerond, daarbij alleen beschikkend over de informatie in hun eigen rolbeschrijving, is de eerste ronde gespeeld. Vanaf nu mogen de projectleiders aan de overige spelers vragen te stellen. Deze spelers moeten geheel in lijn met hun eigen rolbeschrijving handelen. De belangen van de actoren die zij vertegenwoordigen zijn van dien aard dat de tweede en derde ronde van het spel, net als de eerste, coöperatief van aard zijn.
2: De tweede ronde duurt maximaal 20 minuten en moet inzicht geven in de context van de kennisoverdrachtsituatie. Voor zover nodig kunnen de bij deel 1 gemaakte keuzes nog worden bijgesteld.
3: De derde ronde duurt maximaal 15 minuten en moet resulteren in een schets van het adviestraject dat OSEC en HYDRA samen denken te doorlopen. De communicatie tussen beide partijen staat daarbij centraal.

[6] *Role playing game designed by P.W.G. Bots, L. Hermans, M.J.C. Rozemeijer and S. Fraikin.*

D.2 Projectleider OSEC

U speelt de rol van Paul/a de Jong, een van de vier adviseurs binnen de stafafdeling *Knowledge Management & Decision Support* van de offshore exploratiemaatschappij OSEC International. U bent door Bert/a Silver, *Chief Executive Officer* van OSEC, in een kort maar indringend telefoongesprek gevraagd om binnen twee maanden met bruikbare gegevens te komen over de zeebewegingen in de directe omgeving van de PF703, een van de offshore installaties van OSEC. Het gaat om gegevens m.b.t. verwachte stroming en golfslag voor de komende 10 tot 15 jaar, rekening houdend met klimaatontwikkelingen. De CEO legt deze vraag bij u neer, omdat u vanuit uw achtergrond in offshoretechniek over enige waterloopkundige kennis beschikt. Bovendien bent u enigszins bekend met onderzoek- en adviesbureaus op dit gebied.

Silver staat bekend als iemand die goed kan delegeren, maar bij belangrijke strategische keuzes de zaak graag in eigen hand houdt en zeker niet over één nacht ijs gaat. Als CEO is hij een druk bezet man en moeilijk te bereiken voor u als staf-adviseur. Het is duidelijk dat het zeer gewaardeerd wordt wanneer U tijdig met betrouwbare gegevens komt, zonder de CEO lastig te vallen met overbodige vragen; U bent tenslotte degene met de meeste waterloopkundige kennis binnen OSEC International.

Uit het korte telefoongesprek met Silver is u duidelijk geworden dat de gevraagde informatie uiteindelijk moet dienen om de levensduur van de betreffende PF703 te kunnen bepalen. Grondslag en stroming zijn de belangrijkste oorzaken van slijtage aan offshore-installaties van dit type. Silver noemde uw collega Marc/ia Schräger, *Chief Engineer* bij de business unit OSEC-NWM die het beheer over de PF703 voert, als degene met kennis van zaken over het bouwjaar van de PF703 en toestand waarin deze installatie thans verkeert.

In het verleden heeft u al eerder zaken gedaan met het waterloopkundig adviesbureau HYDRA. Hun expertise op het gebied van zeebewegingen is veelzijdig, en u verwacht dat zij met behulp van hun state-of-the-art waterloopkundige modellen de gevraagde informatie zullen kunnen leveren. Uw contactpersoon bij HYDRA indertijd was Fedor/a Vieira da Silva. U heeft telefonisch een afspraak gemaakt om over een mogelijke opdracht te spreken.

Spelinstructies:
In de eerste ronde (15 min.) probeert u samen met Vieira da Silva tot een eerste definitie van het adviesproject te komen. U doet dit door de opdrachten van deel 1 van de *template* uit te voeren. De overige spelers hebben in deze ronde een spreekverbod; zij observeren slechts.
In de tweede ronde (20 min.) analyseert u aan de hand van deel 2 van de *template* de context van de kennisoverdrachtsituatie. Vieira da Silva en u mogen nu wel vragen aan de andere spelers stellen, die zij naar beste vermogen zullen beantwoorden.
In de derde ronde (15 min.) specificeert u aan de hand van deel 3 van de *template* de wijze waarop u informatie-uitwisseling binnen het project gestalte denkt te gaan geven. Het kan zinvol zijn de spelers van de betrokken partijen daarover te raadplegen.

D.3 Projectleider HYDRA

U speelt de rol van Fedor/a Vieira da Silva, projectleider bij het waterloopkundig adviesbureau HYDRA. U bent telefonisch benaderd door Paul/a de Jong van OSEC International om een mogelijke opdracht te bespreken. In het verleden heeft u al vaker in het kader van adviesopdrachten voor OSEC met De Jong samengewerkt. Daarbij ging het steeds om welomschreven modelsimulaties. HYDRA heeft in de loop der tijd een grote verscheidenheid aan modellen ontwikkeld waarmee veel verschillende waterloopkundige analyses kunnen worden uitgevoerd. Niet alle modellen zijn even goed gevalideerd en voor kennis over de details van de modellen doet u doorgaans een beroep op de expertise van uw collega Eric/a Haaring, de expert op dit gebied binnen HYDRA.

Als adviesbureau is het voor HYDRA van belang om de kennis op peil te houden en continu bezig te blijven met het vernieuwen en verbeteren van de waterloopkundige modellen. In het aannemen van opdrachten maakt U dan ook een onderscheid tussen twee typen opdrachten: de adviesopdrachten, waarbij snel geld verdiend kan worden door het inzetten van beschikbare en betrouwbare state-of-the-art modellen, en de onderzoeksopdrachten, waarvoor nieuwe modeltoepassingen ontwikkeld of getest worden. Op dit laatste type projecten hoeft HYDRA minder grote winstmarges te halen omdat de ontwikkelde kennis en modeltoepassingen voor toekomstige adviesopdrachten gebruikt kunnen worden. Overigens leveren onderzoeksopdrachten doorgaans ook iets meer onzekerheden op voor de klant, omdat er tenslotte geen gebruik maakt wordt van “tested knowledge”, waardoor doorlooptijd van het project en de betrouwbaarheid van de uitkomsten minder goed van tevoren ingeschat kunnen worden.

U bent al een aantal jaar werkzaam als projectleider en U weet dan ook dat het belangrijk is om datgene te leveren waar de klant om vraagt. Om deze opdracht naar tevredenheid van de klant, OSEC, uit te kunnen voeren, is het dan ook van belang om een duidelijk gespecificeerde opdracht te krijgen, waarin alle vaagheden zijn weggenomen, om te voorkomen dat door miscommunicatie de klant uiteindelijk ontevreden is met een eindproduct dat niet aan zijn verwachtingen voldoet. Overigens speelt dit niet alleen mee vanwege de klantgerichte benadering van HYDRA, maar ook om een degelijk contract op te kunnen stellen voor deze opdracht, om eventuele claims en procedures te voorkomen. Voor onderzoeksopdrachten ligt dit natuurlijk iets minder vast, vanwege het vernieuwende en veelal verkennende karakter van deze opdrachten.

HYDRA heeft een goede naam in de branche en staat bekend als een betrouwbaar en deskundig bureau. Vanzelfsprekend is HYDRA zuinig op die goede naam, en is het dan ook van belang dat U tijdig betrouwbare uitkomsten kunt overleggen conform de wensen van de klant.

Spelinstructies:
In de eerste ronde (15 min.) probeert u samen met De Jong tot een eerste definitie van het project te komen. U doet dit door de opdrachten van deel 1 van de *template* uit te voeren. De overige spelers hebben in deze ronde een spreekverbod; zij observeren slechts.
In de tweede ronde (20 min.) analyseert u aan de hand van deel 2 van de *template* de context van de kennisoverdrachtsituatie. De Jong en u mogen nu wel vragen aan de andere spelers stellen, die zij naar beste vermogen zullen beantwoorden.

In de derde ronde (15 min.) specificeert u aan de hand van deel 3 van de *template* de wijze waarop u informatie-uitwisseling binnen het project gestalte denkt te gaan geven. Het kan zinvol zijn de spelers van de betrokken partijen daarover te raadplegen.

D.4 Golfbewegingspecialist HYDRA

U speelt de rol van Eric/a Haaring, hydrodynamicus bij het waterloopkundig adviesbureau HYDRA. U bent expert op het gebied van golfbewegingen en stromingen in kustwateren en beschikt over jarenlange ervaring met hydrologische modelberekeningen.
U bent betrokken bij het EU-programma COFLO, gericht op het ontwikkelen van een nieuwe generatie computermodellen die kennis op het gebied van hydrodynamica, morfologie en meteorologie moeten gaan integreren. U bent dan ook goed op de hoogte van internationale ontwikkelingen op dit gebied.

Uw eigen interesse gaat dan ook uit naar het ontwikkelen en toepassen van nieuwe modellen en analysemethoden. Echter, voor de meer standaard adviesopdrachten heeft U een aantal standaardmodellen tot Uw beschikking, waarmee U bijvoorbeeld in staat bent om op redelijk korte termijn en met voldoende betrouwbaarheid resultaten te verkrijgen. De standaardmodellen geven een betrouwbaar beeld van basisparameters als gemiddelde golfhoogte (H_s). Voor meer gedetailleerde informatie zijn deze standaardmodellen doorgaans niet geschikt, maar moet U aanvullende modellen gaan gebruiken die meer tijd kosten.

Voor de gemiddelde golfberekeningen heeft u een standaard lineair golfmodel wat u koppelt aan een Oceanmodel en een windforcing. U heeft via een abonnement met het KNMI altijd toegang tot de relevante wind-data. Hierdoor kunt u een gemiddelde strijklengte in het model voeren. Het model rekent echter een maximale golfhoogte (H_{max}) uit van $2.2*H_s$, iets wat toch een zware onderschatting is van de praktijk. Dit model heet WAVES. Het draaien van dit model duurt ongeveer een week.

Om toch tot een betere schatting te komen van H_{max} is het mogelijk een extra berekening te doen met de berekende resultaten van WAVES. Door een aantal non-lineaire statistische berekeningen met empirisxche formules te doen wordt de voorspelling van H_{max} aanmerkelijk beter. Het berekent een H_{max} uit van $3*H_s$. Dit komt al dichter in de buurt van de waarnemingen. Het $WAVES_{max}$ model kost echter wederom een week extra rekenen.

De volgende kwaliteitsverbeteringsslag wordt wetenschappelijk interessant. In WAVES en $WAVES_{max}$ werkt u met een gemiddelde wind. Nu is het door de verbeterde rekenkracht mogelijk om een actueel windveld in te voeren. De huidige inzichten laten namelijk zien dat het vooral de verandering van windrichting en intensiteit is die de H_{max} en H_s bepalen. U bent erg benieuwd hoe dat model ($WAVES_{actual}$) zou uitpakken. Dit nieuwe model zou ongeveer een maand kosten om te maken. Daarna zou ook $WAVES_{max}$ model gedraaid moeten worden op basis van deze resultaten. Het berekent waarschijnlijk een H_{max} uit van $3.5*H_s$.

Het echte leuke werk begint bij de nieuwe generatie modellen. Hierbij kunnen niet-lineaire golfvoorspellingen gedaan worden door de toepassing van de non-lineare Schröder-theorie.

Dit modelleerwerk staat nog in de kinderschoenen maar is wel veelbelovend: het berekent een H_{max} uit van $4*H_s$, iets wat goed overeenkomt met de waarnemingen. Het is echter niet makkelijk uit te voeren. Het kost minimaal zes maanden om een aantal getallen te produceren. Het is echter wel de toekomst. Misschien kunt u de projectleider interesseren daar wat extra onderzoeksbudget tegen aan te zetten.

D.5 Chief Executive Officer van OSEC

U speelt de rol van Bert/a Silver, de CEO van OSEC International.OSEC is een bedrijf met winstdoelstelling, en daar bent u in het bijzonder van doordrongen. Offshore-installaties vergen grote investeringen die over een lange periode moet worden terugverdiend. U houdt zich in het bijzonder bezig met de economische levensduur van deze installaties.

In principe geldt dat een installatie goedkoper is naarmate hij langer in bedrijf blijft. Echter, naarmate een installatie ouder wordt nemen de onderhoudskosten langzaam maar zeker toe. Op basis van een prognose van enerzijds de kosten van operatie, onderhoud en afschrijving en anderzijds de opbrengsten die met het in bedrijf houden van de installatie worden bereikt kan in de tijd een *break-even point* worden bepaald. Op dat tijdstip zijn de grenzen van de economische leven sturen van installatie bereikt en wordt het tijd de installatie te ontmantelen.

Deze eenvoudige rekensom is in de praktijk een stuk ingewikkelder. De genoemde kosten zijn redelijk goed in te schatten zolang de installatie in goede staat verkeert. Dat wordt moeilijker naarmate de constructie door de elementen meer wordt aangetast. Op enig moment wordt een installatie onveilig en neemt de kans op kostbare incidenten toe. Ook de ontmantelingkosten zullen i.v.m. extra veiligheidsvoorzieningen toenemen naarmate de installatie onveiliger wordt.

Sinds begin vorige week heeft het offshoreplatform PF703 uw bijzondere aandacht. De productiecijfers over de laatste maanden blijven achter bij de verwachting en het lijkt er op dat het einde van de economische levensduur van deze installatie nadert. U wilt nu het tijdvenster vaststellen waarbinnen de PF703 het beste ontmanteld kan worden.

Voor precieze gegevens over de kosten en baten van een installatie kunt u uit diverse bronnen binnen OSEC International putten. Gegevens m.b.t. de toestand waarin de PF703 thans verkeert kunt u bijvoorbeeld bij de business unit OSEC-NWM, die het beheer over de PF703 voert, opvragen. Uw contactpersoon aldaar, Marc/ia Schräger, heeft desgevraagd bevestigd over die gegevens te beschikken, maar heeft aangegeven dat OSEC-NWM over onvoldoende informatie beschikt om een goede prognose van de veiligheid en de daarvan afgeleide kosten te kunnen geven. De sterkte van de PF703 hangt namelijk niet alleen af van het ontwerp en de bij constructie gebruikte materialen, maar vooral ook van het natuurgeweld waaraan de installatie loop der jaren is blootgesteld. Nu geven periodieke metingen door duikers aan de constructie weliswaar een goed beeld van de conditie waarin de PF703 thans verkeert, maar om te kunnen voorspellen hoe de installatie zich in de komende jaren zal gaan houden zijn prognoses voor omgevingsfactoren, in het bijzonder golfslag en stromingen, onontbeerlijk.

U heeft Paul/a de Jong, adviseur binnen de stafafdeling *Knowledge Management & Decision Support* van OSEC, telefonisch de opdracht gegeven om de ontbrekende informatie van een externe partij te betrekken.

D.6 Chief Engineer bij OSEC-NWM

U speelt de rol van Marc/ia Schräger, *Chief Engineer* bij de business unit OSEC-NWM. Deze business unit verzorgt het technisch onderhoud aan alle offshore installaties in de sector North-West. U bent onlangs door Bert/a Silver, de *Chief Executive Officer* van OSEC International, gebeld met een verzoek om specifieke informatie over het offshore platform PF703. Silver wil een inschatting maken van de technische levensduur van deze installatie, waarschijnlijk om te bepalen wanneer hij uit bedrijf moet worden genomen. Uiteindelijk moet zo'n ding natuurlijk geld opleveren, en binnen afzienbare tijd zal de productie van het platform minder worden terwijl de onderhoudskosten geleidelijk zullen blijven stijgen.

Nu verkeert de PF703 op dit moment nog in goede staat. Het platform doet al 20 jaar dienst en zou het nog wel eens 20 jaar kunnen uithouden, maar dan is het wel een ouwe brik met mankementen geworden.

*constructie waarschijnlijk overgedimensioneerd; behoorlijke stijfheid, weinig invloed van normale zeegang
*elke 2 jaar precieze metingen aan constructie om mogelijke vervormingen op te sporen
*PF703 heeft vooral te lijden van zware zeegang: storm ter plaatse en hoge uitlopers
*onderhoud vooral elektrolytische bescherming tegen corrosie

D.7 Chief Executive Officer van BAS Ltd.

U speelt de rol van Lana/r Torvaldsen, Chief Executive Officer van het offshore constructiebedrijf BAS Ltd. Uw bedrijf is gespecialiseerd in grote staalconstructies en heeft in 1980 het onderstel en de grote beweegbare onderdelen voor de PF703 ontworpen en gebouwd.

*gedetailleerde kennis van constructie van PF703
*weet dat PF703 behoorlijk overgedimensioneerd is, en dus duurder dan noodzakelijk
*heeft belang bij lange levensduur PF703 i.v.m. kwaliteitsimago
*heeft belang bij snelle uitbedrijfname want maakt goede kans op sloopcontract
*heeft belang bij onderzoek naar golfbewegingen, want kan daarmee beter (probabilistisch) ontwerpen, met levensduurgaranties afgestemd op golfbelasting
*heeft belang bij samenwerking met HYDRA en OSEC in groter onderzoeksproject, bijvoorbeeld gericht op specifieke model- en toolontwikkeling t.b.v. ontwerp van toekomstige constructies

E Results of the final workshop

Table E.1: *Registration of bottle-necks in the knowledge transfer process an and learned aspects due to the application of the framework.*

Role	Bottle-necks in KTP	Learned
Mediator /client	Differences in knowledge. Differences in learning capability. not enough awareness/use of the psychology of learning. Differences in culture. Projectparticipants who do not function as a team.	To talk with people about the problem is essential to define the problem. The initial template of evaluation is a good checklist to be used during or after the intake. It creates clarity about the situation. It is not advisable to use it as a "guidance". That would block a common sense approach.
Mediator /client	It is often unclear how decisions are made. It is often unclear which considerations have influenced the decision. What is important for policymakers and areamanagers. What is the best way to present the results. The technical knowledge on waterissues often lacks a socio-economic context.	The roleplay made clear that public questions are different from private questions. It made a number of aspects in the KTP explicit.
Mediator	To concretise an undefined policy and management question. To make the client aware that detailed research is needed to answer policy and management questions. Interdisciplinary communication: disciplines do not speak the same language.	Awareness that several steps and stages can be distinguished in the process of KT. Use open questions. Give a summary of the answer to repeat what the client wants and what the client does not want. After the intake, the client must have the assurance that the supplier is aware of the "question behind the question'.
Mediator	Interdisciplinary communication: disciplines do not speak the same language although they use the same words. Perception differences between client and supplier. The client (often policy and management) has a broad view: large range of topics and disciplines but not very thorough per topic. Suppliers are often specialists in a limited set of topics or disciplines and they have a less broad view.	The initial template of evaluation is a good checklist to be used during or after the intake.
Mediator	Often knowledge is produced for a certain decision to be taken. However, in the translation process of knowledge gap to question posed the origin of the question is often lost (question behind the question).	
Mediator /supplier	The interaction between company and clients and suppliers.	The initial template of evaluation seems useful for intake of assignments.
Mediator /supplier	The client often prefers a reply with more context whereas the supplier often is not aware of that preference. The knowledge of the supplier often lacks the context. How can one create a dialogue between client and supplier during the process of knowledge development	The initial template of evaluation helps to focus the intake and the KT-process
Mediator /supplier	In principle both problem definition and initial template of evaluation of judgement are defined by participants and stakeholders. What/who determines the relevance of the participants and stakeholders invited? No transparent, causal relation between policy and management aims and the criteria for monitoring and detailed research question (link between the question and the question behind the question)	It is important to define all actors and their interests of the organisations involved (especially the client).
Supplier	Area of tension were knowledge is retrieved as research results but used in the more sensitive policyfield. Question is not always clear Client is not always amenable to the advise formulated. Sometimes conflicting interests play a role (this supplier is working in a governmental mediator organisation). Difference in wishes of public and private clients.	To listen carefully to the wishes of the client by using purposeful questions. To give the full range of possibilities with mentioning capability and limitations. Confirm if the problem perceived is what was meant by the client.
Supplier	Unclear question from the client. Often knowledge is offered by a supplier who has also defined	The initial template of evaluation is a good checklist to be used during or after the intake.

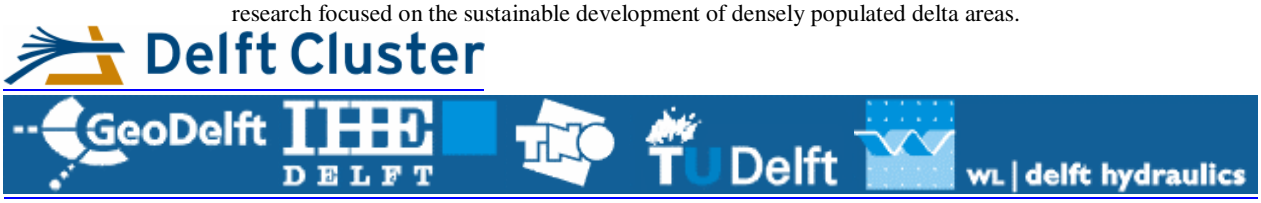
	the question without interference of the client.	It creates clarity about the situation.
Supplier	Differences in the perception of the problem and solution (product). Especially a complicated issue like integrated coastal zone management is difficult. The supplier wants to offer a process, whereas the client prefers readily usable products. Lack of believe in the reliability of either client or supplier.	

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	:	Coast and river		
Baseproject name	:	Connection with end-users		
Project name	:	Knowledge transfer in watermanagement: a communication		
Projectleader/Institute		Dr. M.J.C. Rozemeijer		WL | Delft Hydraulics
Project number	:	03.04.01		
Projectduration	:	01-03-2000	-	30-06-2003
Financial sponsor(s)	:	Delft Cluster		
		WL | Delft Hydraulics		
		University Twente (UT), Faculty of Civil Engineering		
		Technical University (TU) Delft, Faculty of Technology, Policy and Management		
		Dutch National institute for Marine and Coastal Management of the Directorate-General of Public works and Water Management (RWS-RIKZ)		
		Road and Hydraulics Division of RWS (RWS-DWW)		
		TU Delft, Faculty of Civil Engineering		
		IHE – Delft		
Projectparticipants	:	WL | Delft Hydraulics		
		TU Delft, Faculty of Technology, Policy and Management		
		UT, Faculty of Civil Engineering		
		IHE – Delft		
		TU Delft, Faculty of Civil Engineering		
		IHE – Delft		
Total Project-budget	:	€ 366.000		
Number of involved PhD-students	:	3		
Number of involved PostDocs	:	0		

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



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The realisation of this report involved:

Name	Organisation
1	
2	
3	