Knowledge Management
in Space for the River
A new challenge for local government

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Foreword

My thesis has been an interesting journey through the world of knowledge management and of the Dutch public administration. The Programma Directie Ruimte voor de Rivier (PDR) has given me the opportunity to look behind the scenes of an organization involved in a large infrastructure project. I’m very grateful for the fact that I was able to use their resources and that they gave me freedom to do my own research. I like to thank personally Hans Brouwer and Annika Hesselink for their efforts in assisting me by reflecting on my work. Furthermore, I would like to thank all the project managers of the different projects who were willing to help me. They provided the necessary information for the success of my thesis. The status as an outside evaluator seemed to work in my favour and it made it possible to hear the story from both sides (PDR as well as the different projects). At last, I like to thank Lindy, Marcella and Ferry for reviewing my work and helping me with editing this report.
Summary

Introduction
In 2000, the Dutch government initiated the programme Space for the River. The programme includes 41 flood prevention measures in the Rhine-delta to deal with the increase in discharge in the next century. Instead of dike strengthening, the programme uses measures such as dike relocation, depoldering or lowering of the floodplains to create more space for the water. These kinds of measures have a big social impact, which makes communication with local stakeholders important. Therefore, the project-design (and implementation) has been decentralized to local government as they have more local knowledge. Traditionally, the Directorate General for Public Works and Water Management managed these kinds of projects. Consequently, some local governments (provinces, municipalities or waterboards) lack the knowledge to manage such a large infrastructure project including public participation. This study starts with the hypothesis that the new project-structure in the programme Space for the River (i.e. the decentralization of project-design) is new and that it is essential to share knowledge effectively in order to finish the programme before 2015 within budget and with improved spatial quality.

This study will focus on the current knowledge sharing system (i.e. knowledge management system) and will address its problems and successes. This study will also provide recommendations to improve that knowledge management system in the programme Space for the River. The scope of this research is limited to knowledge sharing between the organizations in the programme Space for the River (DGR, PDR, regional and local governments), because this aspect in the knowledge management literature is limited and therefore interesting and relevant to explore. In other words, the scope does not include the processes within the organizations.

In order to carry out the evaluation of the current knowledge management system and the design of an improved knowledge management system, the following research questions need to be answered:

1. What is the role of knowledge in the programme Space for the River?
2. Is knowledge managed effectively in the programme Space for the River?
3. What are the requirements and constraints of a knowledge management system in the programme Space for the River?
4. What should an effective knowledge management system between the organizations of Space for the River look like?

Method
The first step of this research is a literature study, which tries to determine the relevant definitions around knowledge management. The focus is on knowledge management in and between public organizations. In addition, some experts are interviewed in order to provide some input from practical experiences. These two sources of information should make it possible to establish a framework to evaluate the effectiveness of the current knowledge management system.

The second step is to select two case studies. Within the two case studies several stakeholders (organizations) are interviewed to estimate the effectiveness of the knowledge management system. However, the case studies focus on individual projects and provide insufficient information about knowledge sharing between the projects. Therefore, next to the case studies, the evaluation will include interviews with more project managers both from local government as well as from DGR projects.

The third step is to use the interviews and the framework to estimate the effectiveness of the current knowledge management system. The results of this estimation form the input for the design of an improved knowledge management system. Furthermore, the requirements and constraints are gathered
from the stakeholders and form the Basis of Design (BoD). The BoD is also input for the design phase.

Figure 1 shows the research structure as used during this study.

![Research structure diagram](image)

**Theory**

Knowledge management is defined as a continuous process of creation, sharing and exploitation of knowledge in a systematic way within an organization and outwards towards stakeholders (Bots & de Bruijn, 2002; Liebowitz, 2005; Cong & Pandya, 2003; Davenport & Prusak, 1998). This research will not focus on the process of creating new knowledge and the process of using new knowledge. These processes take place inside the organizations and are different for each organization. A study to these processes is not within the scope of this research. The organizations within the programme Space for the River use technical knowledge and management knowledge. Technical knowledge includes knowledge of specialized fields like hydraulics, spatial quality, law, finance and more. Management knowledge includes both controlling and steering of people and processes. On project-level, the organizations use local knowledge as well, which implies knowledge of local geographical and political aspects.

For public organizations, like those in the programme Space for the River, knowledge management should result in stakeholder satisfaction (Love et al., 2005). All aspects of knowledge management that contribute to more stakeholder satisfaction can be seen as effective. But for each stakeholder, the level of satisfaction to share knowledge is determined by different aspects (stakeholders have different values). This makes it almost impossible to design a questionnaire with all the right questions that will address all these possible aspects. Furthermore, some stakeholders will be satisfied with an ineffective knowledge management system, due to strategic reasons. Consequently, the effectiveness will be estimated using an evaluation framework based on knowledge management literature.

The tree elements of a knowledge management system, people, processes and technology, (Cong & Pandya, 2003) can help to estimate the effectiveness of the system in the programme Space for the River. I assume that if all the elements of a knowledge management system were present and addressed properly, the knowledge management system should be effective. In other words, in order to improve the current knowledge management system, I need to address all three
The findings in the literature of knowledge management support the hypothesis that it is essential for the success of the programme Space for the River that the different organizations exchange knowledge.

**Evaluation**

A way to indicate how effective a knowledge management system is, is to measure the direct results of that system (like more innovation, fewer costs, better project quality, etc), because these results determine the success of the programme Space for the River. However, these direct results are influenced by many other factors like organizational structures, responsibilities, capacities, civil servant personal expertise and otherwise available intellectual capital (Wiig, 2002) (see figure 2). Therefore, it is difficult to estimate the exact contribution of the knowledge management system. Another problem is that these results themselves are difficult to measure. For example, Reduction of project time is a clear indicator, but is difficult to measure, because it is difficult to know what the project time would be without effective knowledge management. Furthermore, the scientific literature doesn’t provide any norms for estimating the exact level of effectiveness, because each situation requires a different set of norms (Riege, 2007).

![Figure 2: Causal diagram](image)

Since it is impossible to measure the results of a knowledge management system, it is helpful to look to the conditions for an effective system. The design of a knowledge management system should be done according to certain design principles. These design principles are categorized in the three elements of a knowledge management system. The identification of these design principles should be done according to the context of the system, because each situation requires a different set of design principles (Riege, 2007) (see figure 3).

This new approach incorporates two assumptions:

- Using the characteristics of the context, all important design principles can be identified.
- If all design principles of a knowledge management system are addressed properly, and spread over the elements people, process and technology, the system is effective.
The appropriateness of the design principles is determined by the context of the knowledge management system. In other words, the context must be identified first before searching in the literature for the right design principles. The right type of context is determined by the characteristics as shown in figure 4.

The new evaluation framework can be used for the following purposes:

- A manager tool to report the effectiveness to upper management
- A knowledge-manager tool to identify the strong and weak aspects of the current knowledge management system

In this study, the evaluation framework will be used in order to identify the weak points of the system that needs improvement. The Project Organization Space for the River (i.e. upper management) has already decided that the knowledge management system should be improved by the introduction of an extranet. In other words, this makes additional research to estimate the exact level of effectiveness superfluous.

The results

In the case of the programme Space for the River, the context was twofold and has been divided accordingly. On project-level, the characteristics create a context where a large number of public, private and social organizations with different interests have to work together in order to come to a design about a flood prevention measure that has enough support. In order to identify the interests of all the different organizations, public participation is essential (Pahl-Wostl, 2005). Social learning is to be of paramount importance to collective decision-making and hence public participation (Pahl-Wostl, 2005; Mostert et al., 2007). Therefore, the knowledge management system on project-level must enhance the social learning process. On programme level, the context is characterized by an interorganizational setting with only public organizations. These
organizations are doing, in principle, the same, and can enrich their own project by exchanging knowledge. These organizations have the same interest (managing a flood prevention measure), and only profit from knowledge sharing. Therefore, the public organizations (i.e. the projectmanagers and people of the PDR) form a ‘Community of Practice’ (CoP). CoP’s are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly (Wenger, 1998). In other words, on programme-level the knowledge management system must facilitate a CoP.

Combining literature about knowledge management, social learning and CoP’s has identified the appropriate design principles (see table 1 en 2) In order to indicate if these design principles had been addressed properly on project-level, several stakeholders of the Civil Servant Group and a Sounding Board Group have been interviewed in two case studies. For project-level, multiple projectmanagers as well as people from the PDR have been interviewed. These interviews together with some desk research provided sufficient information to come to the following results (see table 1 and 2).

<table>
<thead>
<tr>
<th>Design principles on project-level</th>
<th>Element</th>
<th>Score</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>The stakeholders of the ABG and KBG have face-to-face communication</td>
<td>People</td>
<td>100%</td>
<td>+</td>
</tr>
<tr>
<td>Stakeholders of the ABG and KBG are rewarded for knowledge sharing</td>
<td>People</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Projectmanagement has explicit knowledge management goals</td>
<td>People</td>
<td>50%</td>
<td>+/-</td>
</tr>
<tr>
<td>During meetings there is an open atmosphere of knowledge sharing</td>
<td>People</td>
<td>87.5%</td>
<td>+</td>
</tr>
<tr>
<td>The stakeholders know each other’s core values and interests</td>
<td>Process</td>
<td>100%</td>
<td>+</td>
</tr>
<tr>
<td>The stakeholders know the appropriate contacts of other stakeholders</td>
<td>Process</td>
<td>100%</td>
<td>+</td>
</tr>
<tr>
<td>The stakeholders encounter no problems finding knowledge at other stakeholders</td>
<td>Process</td>
<td>50%</td>
<td>+/-</td>
</tr>
<tr>
<td>The stakeholders have a common database</td>
<td>Technology</td>
<td>30%</td>
<td>-</td>
</tr>
<tr>
<td>The project has a public website</td>
<td>Technology</td>
<td>50%</td>
<td>+/-</td>
</tr>
</tbody>
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Table 1: Results evaluation project-level
Design principles on programme-level | Element | Score | Result
--- | --- | --- | ---
The projectmanagers have face-to-face communication | People | 100% | +
Best practices in one project are shared with other projectmanagers | People | No | -
Tasks are established to identify the information resources necessary for the organizations | People | Yes | +
The PDR informs of and rewards collaborators’ achievements | People | No | -
There are incentives to achieve the overall aims of the programme Space for the River | People | No | -
Projectmanagers have no difficulties of acquiring knowledge from other projectmanagers or PDR | People | 40% | +/-
There is a system to codify explicit knowledge | Technology | No | -
Projectmanagers and PDR have a common database (extranet) | Technology | No | -

Table 2: Results evaluation programme-level

Because the evaluation framework cannot be used to estimate the exact level of effectiveness, the conclusion will only point out the strong and weak points. The weak points pinpoint those aspects that need improvement.

The results show that most design principles on project-level are addressed properly. The analysis doesn’t indicate many weak aspects. However, at this level, other problems hamper social learning such as insufficient process management. These kinds of problems are not included in the thesis. On programme-level, many design principles are not addressed properly. Consequently, the current knowledge management system is not capable of facilitating the CoP effectively. Therefore, on programme-level, I conclude that the programme Space for the River needs an improved knowledge management system that addresses all the design principles as identified for a lively Community of Practice.

**Design knowledge management system**

The evaluation of the current knowledge management system provided sufficient information to design an improved system on programme-level. To increase the success of the new system, I interviewed the users (the projectmanagers and people from the PDR) and identified their requirements and constraints. The design has been divided into a technical design, an institutional design and a process design.

The technical design is concerned with the mechanisms that can help connect people with information, and people with each other. The mechanisms are the projectmanagers meeting day and an extranet. The projectmanagers meeting day is organized four times a year. During this day, the projectmanagers of the different projects meet and attend presentations. In this thesis, I present improvements. An extranet is a private network that uses the Internet to securely share information or operations with selected partners; it is accessible from any web browser (Valaitis et al., 2005). The different functions of such an extranet and their interaction are designed in this thesis.
The institutional design deals with the set of responsibilities, tasks and agreements. It discusses who the users are, what rules they should apply and who becomes the moderator of the extranet. These aspects must be clear to prevent strategic behaviour (i.e. users only take and do not give knowledge). It also includes several methods to stimulate the use of the extranet:

- A recognition or reward system (Wah et al., 2005)
- Full management support (Riege, 2007)
- Participation of users in the co-design of an IC-Tool (Maurel et al., 2004)
- Proving the appropriate resources (Wenger, 1998)
- Build an environment of trust (Wah et al., 2005; Lesser & Prusak, 1999)
- Raise awareness of benefits of knowledge sharing (Liebowitz, 2005; Chourides et al., 2003; Cong & Pandya, 2003)

The process design is concerned with the implementation steps. It takes effort to set up an extranet. It is essential that the implementation goes well, because the success of the extranet is to get a critical mass quickly (minimum number of required users). If users don’t find what they are looking for after a couple of times, they will probably lose faith in the system and stop using it.

**Reflection**

First of all, the evaluation framework in general provides a flowchart that can be used in any context. The results of this research, however, can only be used in any context that matches the context characteristics of the programme Space for the River. In other words, the results for project-level are applicable for any infrastructure projects with public participation. The new project-structure used in the programme Space for the River, however, has not been used before on such a scale. A CoP between public organizations in infrastructure projects is relatively new. Still, if new infrastructure projects will use the same project-structure, the results of this research could be very useful.

Secondly, the inability to estimate the exact level of effectiveness gave the evaluation framework a second purpose: identification of the strong and weak points. However, even the results of this identification rest on the assumptions that the right context has been selected as well as the right design principles. In what way do the characteristics of the context determine the type of context? Is the right context identified? Are all important design principles identified? Additional research is required to create an evaluation framework that is applicable to estimate knowledge management systems in different contexts.
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1) Introduction

1.1) Problem exploration
Al Gore’s documentary ‘An Inconvenient Truth’ (2006) and the report of the International Panel on Climate Change (2007) show the possible effects of the increase of CO₂ in the atmosphere. The sea level is going to rise and the weather for Western Europe will change, resulting in more rain in shorter periods. The expected maximum discharge of the river Rhine at Lobith, the Netherlands, is expected to increase from 15,000 m³/s to 20,000 m³/s by the year 2100 (Enserink, 2004). In order to comply with the safety norms within the river basin of the Rhine, the Ministry of Transport, Public Works and Water Management initiated the national programme Space for the River in 2000.

This programme comprises 41 measures that will result in acceptable water levels during high discharges. Instead of dike strengthening, the traditional method for protection, floodplains are deepened and enlarged where possible. Instead of economic activities, water has become the steering factor within spatial planning (Wolsink, 2005). Because of this, the programme Space for the River is a good example of how The Netherlands anticipate on the introduction of the European Water Framework Directive (2000/60/EC). The Directive specifies that water be managed in a sustainable way. Next to an increase in safety, the realization of the programme must increase or at least maintain the quality of ecological, cultural and regional specific aspects of the floodplains. Consequently, river management needs a new approach, a more integrated approach (Wolsink, 2005).

Additionally, the Directive states that water must be managed in cooperation with the local community (EU, 2000). This is necessary because citizens have become more demanding, better educated, and operate more and more individually (Rooij, 2006). Cooperation with the local people requires that the public should be involved in the decision-making process on both a national and a regional level. Regionally, organisations are to be given the chance to participate in sounding board groups (EU, 2000). This will enlarge the network of stakeholders. Changes in policy create new interdependencies and new patterns of interaction (Brink & Meijerink, 2005). Therefore, having more stakeholders increases the complexity of managing that network.

The programme Space for the River tries to include the local community as much as possible by decentralizing the decision-making process. Although the Directorate General for Public Works and Water Management (DGR) is responsible for realizing the programme, it has delegated project management of the different measures to local and regional government, consisting of provinces, municipalities and waterboards. These institutions are considered to be more capable of identifying and communicating local and regional requirements, which could increase support for possibly controversial policy proposals and could improve the quality and effectiveness of policy proposals (Enserink & Monnikhof, 2003).

The responsibility of DGR for the completion of the programme by 2015 requires them to monitor the progress of the different measures. They installed the Programma Directie Ruimte voor de Rivier (PDR), which will audit the different local and regional governments not only on progress, but also on budget, spatial quality and safety. This should prevent the problems that have occurred at other large infrastructure projects such as the new railway tracks Betuwe Lijn and HSL. These projects have exceeded their budget and were not finished on time. The role of the PDR is new, because the DGR used to manage the decision-making process and implementation themselves.

The decentralization of project management implies a shift in knowledge competencies. The DGR needs more process knowledge to facilitate, coordinate and audit the regional and local...
governments. On the other hand, it needs less technical knowledge, because I assume that auditing a plan requires fewer professionals in comparison to designing a plan. For local government, these kinds of projects are often new in type and scope and require substantial technical knowledge and local knowledge about the interests of local actors, such as citizens, companies, environmental organizations and other social organizations. In the case of river basin projects, waterboards can be expected to have more knowledge in comparison to a municipality. Still, most regional and local governments have to acquire more knowledge.

This study starts with the hypothesis that the project-structure in the programme Space for the River is new and that it is essential to share knowledge effectively in order to finish the programme before 2015 within budget and improved spatial quality.

This research will focus on the current knowledge sharing system (i.e. knowledge management system) and will address its problems and successes. This thesis will also provide recommendations to improve that knowledge management system in the programme Space for the River. The scope of this research is limited to knowledge sharing between the organizations in the programme Space for the River (DGR, PDR, regional and local governments), because this aspect in the knowledge management literature is limited and therefore interesting and relevant to explore. In other words, the scope does not include the processes within the organizations.

1.2) Goal specification
First of all, this study starts, if possible, with the corroboration of the hypothesis as stated above. It aims to identify the different aspects that hinder or stimulate the organizations within the programme Space for the River to share knowledge. I will analyse the current situation empirically in order to discover these different aspects. The first goal is to estimate the effectiveness of the current knowledge management system. The level of effectiveness is used to test the hypothesis and to indicate further improvements of the knowledge management system. Effectiveness is defined as the level of user satisfaction about the ability to share knowledge. However, as will be explained in chapter 5, in the case of the programme Space for the River, user satisfaction will be difficult to estimate. Therefore, the effectiveness will be estimated using an evaluation tool.

Secondly, with the results from the analysis and additional information from the users of the knowledge management system (the organizations), I will design an improved knowledge management system (if necessary). In other words, the second goal of this study is to provide an improved system that stimulates knowledge sharing effectively, which is needed to attain the goals of the programme Space for the River (budget, planning, safety and spatial quality). The second part of this thesis is done in cooperation with the PDR, who have decided to improve the current knowledge management system.

1.3) Research questions
In order to estimate the effectiveness of the current knowledge management system and design an improved one, this thesis needs to address certain issues. These issues result in the following research questions:

1. What is the role of knowledge in the programme Space for the River?
   1.1 What are knowledge and knowledge management?
   1.2 What are the benefits of knowledge management?
   1.3 What are the difficulties with knowledge management between organizations?
2. Is knowledge managed effectively in the programme Space for the River?

2.1 Which framework is appropriate to estimate the effectiveness of a knowledge management system between public organizations?

2.2 Which organizations are in the programme structure and what are the aspects that hinder them to share knowledge?

3. What are the requirements and constraints of a knowledge management system in the programme Space for the River?

4. What should an effective knowledge management system between the organizations of Space for the River look like?

4.1 Which aspects of the knowledge management system should be improved according the findings at research question 2?

4.2 Which aspects of the knowledge management system should be improved according to the users of this system?

Research question 1 is the exploratory phase of this research. It addresses the meaning of knowledge and knowledge management as well as its effects on projects. Important are the different aspects of a knowledge management system between public organizations. Research question 2 identifies the problems and missed opportunities concerning knowledge management in the programme Space for the River. Important is to identify or create a framework that is able to determine the effectiveness of the current knowledge management. Together with the organizations in the programme it should be possible to identify this effectiveness. Research question 3 identifies the additional needs of the organizations in the programme Space for the River concerning the knowledge management system. The requirements and constraints of the different organizations will form the Basis of Design (BoD). At research question 4, the most appropriate aspects of a knowledge management system are selected according to the results of the analysis (question 2) and the BoD (question 3).

1.4) Outline of the thesis
This report starts with an exploration of the programme Space for the River. It will explain the mission, the organizations involved and the new approach to river management (chapter 2). The next chapter, chapter 3, will provide the research method. This includes the different steps to answer the research questions and ultimately satisfy the research goals. Chapter 4 will give the theoretical background of knowledge management. It offers a good basis for understanding the problems with the current knowledge management system. Chapter 5 will include the actual evaluation of the current knowledge management system. The next chapter uses the result of the evaluation to design an improved system. The last chapter, chapter 7, will reflect on the limitation and further research possibilities.
2) Space for the River

2.1) Introduction
In this chapter the content of the programme Space for the River is presented, in order to establish a clear understanding of some important definitions, flood prevention measures and procedures. Section 2.2 gives an overview of the different flood prevention measures within the programme Space for the River. Section 2.3 provides an insight into the organizational structure on the different levels of the decision-making process. Section 2.4 explains the different spatial planning procedures within the programme Space for the River.

2.2) Space for the River projects
The programme covers the river basin of the Rhine and a small part of the river basin of the Meuse. The programme includes several measures in order to prevent flooding at high discharges for the Rhine at Lobith (16,000 m³/s) and Meuse at Borgharen (3,800 m³/s) (Projectorganisatie Ruimte voor de Rivier, 2007). The second goal of the programme is to maintain or increase the spatial quality of the floodplains.

In order to reach these two goals, the programme Space for the River consist of 41 measures, which are carried out by local government and the DGR (called initiators). Some initiators manage multiple measures that are included in one project. The programme covers the rivers as shown in figure 5. The red dots symbolise the 41 measures. Appendix A: all measures of the programme Space for the River gives an overview of all the measures and governments that are managing it.

Figure 5: Map of the 41 measures of the programme Space for the River
Source: www.ruimtevoorderivier.nl
The programme Space for the River has tried to refrain from dike strengthening where possible, because strengthening is considered not sustainable. Paradoxically, higher dikes increase flood damage potential. If the dike gives way, the water levels will rise faster than without the heightening and will seriously threaten the lives of those residents who cannot move quickly (van de Ven, 1996). Instead of dike strengthening, the embanked floodplains of the rivers will be enlarged, which results in safe water levels during high discharges. Still, 11 measures are dike-strengthening projects, mostly in the Neder-Rhine and Lek, because these rivers have little space left for creating more Space for the river.

The different measures have a social impact on the local people. This is the case with dike relocation and flood bypasses (or Green rivers) because most of the time these measures imply that people or businesses have to move or adjust their way of living. For an effective implementation, the initiators (local government or DGR) need the support of these people. Other measures like lowering of groynes or deepening of the base flow course affect fewer people, resulting in a smaller network of stakeholders and hence less complexity of decision-making (De Bruijn & ten Heuvelhoff, 1999).

The different kinds of measures are shown in figure 6.

1. Lowering of the river floodplains
   By removing soil out of the floodplains, the height-difference between the bottom of the floodplain and the top of the dike increases. Consequently, the volume between the dikes increases resulting in lower water levels at high discharges. However, many floodplains have polluted soil, which needs to be disposed of carefully.

2. Removing of hydraulic obstacles
   By removing residents, barns or pillars of an old bridge, the water has less resistance. Consequently, there is less titling of water, which result in lower water levels.

3. Dike relocation or depoldering
   By relocating the dike, the volume of the floodplain increases, resulting in lower water levels at high discharges. This has a big social impact, because it often entails that people and businesses have to abandon their properties.

4. Detention reservoir
   By storing water temporarily in a detention reservoir, the volume of the water decreases, which results in lower water levels in the river. However, the area needs special adjustments, such as new dikes, which could affect many local people.
5. Creating flood bypasses
A flood bypass can help to discharge water. Often, such a bypass is used with a low frequency. Still, at high discharges, the water will flow along two sides, which could imply that some residents are trapped on an island. Additionally, it requires a lot of adjustments in the area of the bypass, which affects many local people.

6. Lowering of groynes
By lowering the groynes, the water has less resistance during high discharges. Consequently, there is less titling of water, which result in lower water levels.

7. Deepening the base flow course
See 1. Lowering of the river floodplains

8. Dike strengthening
At some places, like the river Lek, there are almost no possibilities to give the water more space. Here, the only option is dike strengthening, which increases the volume between the dikes, minimizing the chance of a flood.

9. Dike improvement
Some dikes need improvement, because they need maintenance or have to be adjusted to the new situation. Examples are seepage screens or dikes that are resistant against water that would normally flow underneath the dike.

2.3) Programme organization
The programme Space for the River is the responsibility of the DGR. They have to make sure that all 41 measures are ready before 2015 and within the budget of 2.2 billion euro. The DGR used to manage these kinds of projects themselves or in cooperation with private companies. The decentralization of projectmanagement is a new situation for the DGR. It creates a new project-structure. Instead of communicating with the whole project-environment (all relevant stakeholders), the DGR communicates only with the local government (see figure 7).

The new project-structure creates a new hierarchy. The DGR have to delegate their responsibilities to a local government. This requires a fine balance between steering and the autonomy of local government. Therefore, the DGR need new coordination mechanisms to influence the progress and costs of the programme. First of all, they make a contract with the local government about the required criteria for safety, spatial planning, progress and costs (“bestuursovereenkomst”). Secondly, they use ‘controlled trust’ (gecontroleerd vertrouwen), which means that they audit and facilitate the local government on the same issues as in the contract.

![Figure 7: Original and new project structure](image-url)
The auditing and facilitating is done by the ‘Programme Organization Space for the River’ (PDR), which is a separate organization within the DGR. The head of the PDR, the programme director, answers indirectly to the State Secretary of ‘Transport, Public Works and Water Management’. Ultimately, the State Secretary will take the political decision about the contracts and final designs of each project. In order to audit the initiators, the PDR has a ‘Project Control Unit’ for the financial and planning aspects and a ‘Knowledge Management Unit’ for the hydraulics, spatial quality and other aspects like innovation or archaeology. The initiators have to deliver an overview about the costs and planning every quarter (to Project Control). At decision moments, the other aspects, will be assessed (by the Knowledge Management Unit) on whether they are in line with the criteria set by the DGR.

Furthermore, the PDR has a Secretariaat (Bureau Program Management) and the unit Riviertak Management. The Riviertak Management is responsible for coordinating and facilitating the projectmanagers. They are the field experts and occasionally they attend local meetings and discuss the problems with the projectmanagers. Most communication between the PDR and the projectmanagers goes through them.

In addition, the PDR has a separate unit called the ‘DGR Plan Studies’. Some flood prevention measures are done by DGR, because the local government has no interest in managing those projects. Each project carried out by the DGR is managed by a different project-team (from DGR). The head of the DGR Plan Studies is the overall initiator of these projects and he coordinates the different project-teams of the DGR.

One could argue that the DGR Plan Studies resembles the old project structure, where the DGR did the design and implementation themselves. This could be a reason to exclude them from my research. However, they are important knowledge carriers (they have experience) and the DGR projectmanagers have the same need for knowledge exchange as local government projectmanagers.

Therefore, the projects done by the DGR Plan Studies are considered to be acting organizations in the knowledge management system and are included in this research.

Figure 8 shows all the different units of the PDR.
Each initiator is free to design their project structure. Fortunately, most project managers recognize the need for the public to participate in the decision-making process. In addition, they try to balance the interests of local and regional governments, with those of the national government, especially because some of those governments have to issue permits necessary for the implementation of the project. Therefore, most project structures at local governments include a Steering Committee (Stuurgroep (SC)), a public servants support team (Ambtelijke Begeleidings Groep (ABG)) and a sounding board group (Klankbord Groep (KBG)).

The Steering Committee is made up of the politicians of different local governments and the Programme Director of the PDR. They provide the political support. At some projects, the chairman of the Sounding Board Group attends the meetings of the Steering Committee. All local governments in the Steering Committee have a representative in the ABG. The ABG prepares the meetings of the Steering Committee. They discuss the issues and balance their interest informally. They provide the bureaucratic support. The Sounding Board Group (or KBG) includes local organizations and inhabitants, and in some projects, the members of the public servants support team as well. They are able to offer their opinion to the Steering Committee, which is the alternative that has the most support from the local people. At most projects, the project manager attends all meetings. The KBG provide the social support. Figure 9 shows the organogram of the projects. However, some projects have a slightly different structure.

2.4) Spatial planning procedures
The programme Space for the River is divided into three phases: the Spatial Planning Key Decision phase (2000-2006), the planning studies phase (2006-2010) and the implementation phase (2008-2015). All three phases will be explained in the following section.

Spatial Planning Key Decision
In a Spatial Planning Key Decision (SPKD), the national government describes strategic spatial plans that indicate where, for example, houses, roads, nature development or agriculture should be developed. An SPKD is incorporated in the local and regional spatial plans of provinces and municipalities.

An SPKD for the Space for the River project was needed for two reasons. First of all, an SPKD is a good instrument to incorporate the measures for reducing the floods and the different aspects of increasing the spatial quality like ecology, culture and recreation. Secondly, the implementation of measures for water level reduction needs an overall organization, because these measures affect each other downstream or upstream which is not the case with dike strengthening (Projectorganisatie Ruimte voor de Rivier, 2005).

An SPKD is divided into four phases. During the first phase of the SPKD Space for the River, a
selection of 43 measures was made out of the hundreds of options (Meijerink, 2004). After its publication by the national government, 2,843 reactions from the public were filed. People and organizations complained about the complexity and non-transparency of the process, as well as the fact that in some projects the local point of view (Region Advice) had not been incorporated. Others were concerned about the necessity of taking into account a discharge of 18,000 m³/s in the long run (2050) and its consequences. Additionally, people complained about the vagueness concerning compensation for damages to farms, dwellings, nature and house prices. All reactions were documented and published in SPKD2. In SPKD3, the government incorporated most reactions. This underlines the fact that transparency in the process is important. Therefore, good information towards citizens is crucial. Furthermore, the national government did include the Region Advice in most projects. However, some wishes could not be granted, simply because of a lack of time and money. The predicted discharge of 18,000 m³/s in the long run will be maintained, because it determines what areas along the river should not be used for new projects that have to be terminated after a couple of year because the floodplain will be enlarged. In addition, the government clarified that all damages will be fully compensated as well as the expropriation of land (Projectorganisatie Ruimte voor de Rivier, 2007). The House of Representatives approved the SPKD3 on the 7th of July 2006 and finally the Senate on the 19th of December 2006. SPKD4 was published in the bulletin of Acts and Decrees after six weeks and became legally binding (www1).

Planning studies phase

During the planning studies phase contracts are signed between the ‘Programme Organization Space for the River’ (PDR) and the initiators of the projects, which are called policy agreements (bestuursovereenkomsten). The initiators are provinces, waterboards, municipalities or the Directorate General for Public Works and Water Management (DGR). With this contract, the initiator is committed to realize the project before 2015 according to the required water level reduction, scope, spatial quality criteria and budget. The initiator has to draw up multiple alternatives. The State-Secretary will make a final choice between the alternatives at decision-moment 2 according to the Rules for Wet Infrastructure Projects (SNIP2A). The selected alternative will transform into a detailed design, ready for implementation. During decision-moment 3 (SNIP3) the State-Secretary will approve the final design, which marks the end of the planning phase and the start of the implementation phase (see figure 10) (Ministry V&W, 2006).

The Environmental Impact Assessment (EIA) procedure starts at the same time as the SNIP2A procedure. An EIA is an instrument to give the environment a full-fledged position in the decision-making process. It identifies the impacts on public health and ecology of the projects such as the construction of industry or infrastructure. During the procedure, the public can participate by giving their opinion. The EIA is required for many of the projects in the programme Space for the River and is an important and difficult procedure, which requires much attention from the initiators. (www2; Ministry V&W et al., 2006).
**Implementation phase**

In the last phase of the programme all projects are realized. The activities stretch from the petition of several permits, a planning of the costs, the creation of a list of evaluation criteria and the construction itself. Permits are mainly needed for construction and excavation activities. The number of permits required differs for each project. The implementation phase includes three decision-moments: a decision for the preparation of the implementation (SNIP4), the start of the implementation (SNIP5) and the delivery/evaluation decision (SNIP6). All projects in the programme Space for the River have to be completed before 2015.

Currently, the programme Space for the River is in the ‘Planning Study phase’. Most of the people who worked for the programme during the ‘Spatial Planning Key Decision phase’ have left the organization, which makes it difficult to find information about that phase. Therefore, this study will only concern the knowledge management system in the ‘Planning Study phase’. Also, this study could be used for the ‘Implementation phase’, because it is likely that the initiators will manage the implementation as well.
3) Research method

3.1) Introduction
This chapter will describe the body of techniques used for investigation of the problems with the current knowledge management system and to improve it accordingly. The type of research and the availability of data determine the techniques. Section 3.2 will discuss the type of research and techniques that will be used. Section 3.3 offers an overview of the different steps that have been taken in this research to attain the research goals.

3.2) Type of research
First, it is important to make the type of research explicit. Doing this determines the point of view of the research and indicates which elements are included in the research and which are not (Verschuren & Doorewaard, 2005). Considering the two research goals, I will use two different types of research methods: evaluation and design. The evaluation is an analysis of the current knowledge management system. Its focus is to estimate the level of effectiveness, which could provide a legitimate reason to start the design of an improved knowledge management system. According to Verschuren & Doorewaard (2005), the choice for an evaluation and a design research implies the use of evaluation criteria and a design-model. The evaluation criteria and design-model will be discussed in chapters 5 and 6 respectively.

Secondly, it is necessary to select a research design, indicating how data is gathered. Easterby-Smith et al. (2002) state that the research design depends on the type of social science. They state that the social sciences can be roughly divided in two contrasting philosophical traditions: positivism and social constructionism. Positivism implies that scientific laws once discovered are absolute and independent of further observations (properties should be measured through objective methods). Social constructionism, on the other hand, focuses more on people. The way in which knowledge is communicated and the reasons why people have different opinions or experiences is the focus; the central notion being that ‘reality’ is socially constructed. Social constructionism seeks to understand how people invent structures to help them make sense of what is going on around them. Never will a research belong strictly to one of these traditions; it is not a difference like black or white. However, the difference can be useful when designing a research plan, because the differences between these traditions make the researchers aware of the choices they can make when coming up with a research design.

The choice for a type of social science depends on the characteristics of the problem of the research and the preferences and ideas of the researcher. Easterby-Smith et al. (2002) have identified six important choices researchers have to make when developing a research design:

<table>
<thead>
<tr>
<th>Positivism</th>
<th>Social constructionism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large samples</td>
<td>Small samples</td>
</tr>
<tr>
<td>Testing theories</td>
<td>Generating theories</td>
</tr>
<tr>
<td>Experimental design</td>
<td>Fieldwork methods</td>
</tr>
<tr>
<td>Universal theory</td>
<td>Local knowledge</td>
</tr>
<tr>
<td>Verification</td>
<td>Falsification</td>
</tr>
<tr>
<td>Research is independent</td>
<td>Researcher is involved</td>
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</table>

Sample size
The data for the evaluation must come from the organizations in the programme Space for the River. The current number of organizations is approximately 17. The fact that not all projects have started and not all project teams are complete results in a small sample size, which excludes the possibility of using a statistical method (minimum of +/- 40). This underlines the notion that it is
not possible to estimate the effectiveness of the current knowledge management system by using user satisfaction as a performance indicator.

**Testing theories vs. Generating theories**

Due to the small sample size, the effectiveness of a knowledge management system is determined by using existing literature. However, as chapter 5 will indicate, the current theories on knowledge management do not provide the tools to estimate the level of effectiveness of knowledge management between public organizations. This forced me to generate a new framework to complete this research. In other words, this research could be seen as the start of generating a new theory, because no collaborative tests were done that could support this new theory.

**Experimental design vs. Fieldwork methods**

An experimental design should include an experimental group and a control group. The level of effectiveness of a knowledge management system should be determined by the ability to share knowledge in a situation with and without an effective knowledge management system. By investigating the two extremes, it is possible to estimate the level of effectiveness of the knowledge management system in the programme Space for the River. However, there are no cases or other programmes like Space for the River to make this comparison. In other words, an experimental design is impossible for this research, especially considering the small sample size. The fieldwork method is more an investigation focusing on those parts of the organization that are useful for the research. In the case of this thesis, data was gathered from people in the organizations, through informal conversations and interviews. Therefore, this research has a fieldwork approach.

**Universal theory vs. Local knowledge**

The research attempts to establish a framework to assess the current and design a new knowledge management system in the context of the programme Space for the River. Therefore, its findings will be influenced by the Dutch culture. I don’t think that the outcome and design of this research are applicable in other cultures without changes. I do, however, think that the way to estimate the effectiveness of a knowledge management system can be used universally. In other words, this research contributes to a universal theory as to well as local knowledge (i.e. knowledge management in Dutch river management).

**Verification vs. Falsification**

The distinction between verification and falsification is based on the idea that, although a lot of data can support a theory, it is still impossible to provide ultimate proof that this theory is true (Karl Popper, 1959). For example when you want to prove that all polar bears are white it is not enough to show a hundred polar bears which happen to be white! A solution to this problem is to formulate the theory in such a way that you cannot rebut the theory with one example (verification). Falsification tries to disconfirm a statement in order to prove something. For example, showing a black polar bear proves the fact that NOT all polar bears are white. For research it is more efficient and more informative to find disconfirming evidence. However, people are more sensitive to facts that support their theory than to facts that are not supportive. Falsification is often used in combination with a hypothesis that is tested.

This research has started with a hypothesis and additionally two assumptions are made when designing the new evaluation framework. The hypothesis is falsified if the conclusion of the evaluation states that knowledge management is not essential for the success of the programme Space for the River. If the theory about knowledge management and the evaluation of the current knowledge management system supports the hypothesis, the second question concerns the level of effectiveness that is needed for the success of the programme. In order to test the two assumptions,
the improved knowledge management system needs to be implemented and evaluated. This is not within the scope of this research and consequently, the two assumptions are not tested.

**Research is independent vs. Researcher is involved**

To gather data, I’m dependent on the willingness of the people in the different organizations to help me. In order to retrieve the information for this research, it is essential that they feel comfortable with providing me with ‘sensitive’ information. This requires trust, which is generated by a certain level of acquaintance with these people. I also need some flexibility in the questions in order to be able to create and retain that trust and anticipate on the answers of the participants. In this way I can influence the information from participants. However, this is not enough to be rendered ‘involved’. Therefore, I can be considered to be generally detached and the research can be deemed ‘independent’.

The characteristics of this research tilt towards social constructionism. Easterby-Smith et al. (2002) have arranged several research designs in a matrix with the type of social science and the level of involvement on the axes. According to this matrix, taking into account the characteristics of this research, the case method developed by Yin seems to be the best method to gather data (see figure 11).

![Figure 11:Matrix of research designs (source Easterby-Smith et al. (2002))](image)

### 3.3) Research structure and deliverables

The research structure provides an overview of the different steps that have to be taken in order to attain the research goals (see figure 12).

1) The first step is a literature study, which tries to determine the relevant definitions around knowledge management. The focus is on knowledge management in and between public organizations. In addition, some experts are interviewed in order to provide some input from practical experiences. These two sources of information should make it possible to establish a framework to evaluate the effectiveness of the current knowledge management system.
Deliverable: A framework to estimate the effectiveness of the current knowledge management system.

2) The second step is to select two case studies according to the following selection criteria:

- The initiator is local government, because it is more interesting to analyse the new project structure (in other words, no DGR projects)
- The PDR and the initiator have a contract (“bestuursovereenkomst”)
- The case studies must have different initiators. Some local governments do two or more projects.
- Preferably not dike strengthening, because this is considered not to be innovative and does not need additional knowledge.
- Preferably the same flood prevention measure, because then it makes more sense to share knowledge.

Within the two case studies several stakeholders (organizations) are interviewed to estimate the effectiveness of the knowledge management system. However, the case studies focus on individual projects and provide insufficient information about knowledge sharing between the projects. Therefore, next to the case studies, the evaluation will include interviews with more project managers both from local government as well as from DGR projects.

Deliverable: A list of stakeholders that are interviewed together with the summaries of those interviews

3) The third step is to use the interviews and the framework to estimate the effectiveness of the current knowledge management system. The results of this estimation form the input for the design of an improved knowledge management system. Furthermore, the requirements and constraints are gathered from the stakeholders and form the Basis of Design (BoD). The BoD is also input for the design phase.

Deliverable: The results of the evaluation, the BoD and a design of an improved knowledge management system

![Figure 12: Research Structure](image-url)
4) The role of knowledge (theory)

4.1) Introduction
The search for the problem(s) that limit the ability to share knowledge starts with a clear understanding about knowledge management. This chapter addresses the different aspects of knowledge management in relation to the programme Space for the River. Section 4.2 will provide the definitions of knowledge and knowledge management. Section 4.3 discusses the benefits of knowledge management. Section 4.4 indicates the difficulties and pitfalls of knowledge management. Section 4.5 focuses on knowledge management between organizations and in a public context.

4.2) Definitions of knowledge management
The analysis of the problem must start with a clear and good definition of knowledge management, because it will help to indicate what to look for. The first step is to focus on the definition for knowledge within the context of the programme Space for the River. The second step is to provide a definition for knowledge management that will be used during this study.

Knowledge is “actionable information” meaning relevant and available in the right place at the right time, in the right context and in the right way so that everyone can use it for making clear decisions (Tiwana, 2003). A more elaborate description of knowledge comes from Davenport and Prusak (1998; pp21) who define knowledge as “a fluid mix of framed experience, values, contextual information, expert insight and grounded intuition that provides an environment of and framework for evaluating and incorporating new experience and information. It originates and is applied in the minds of knowers. In organisations, it is often embedded not only in documents or repositories but also in organisational routines, processes, practices and norms”. This definition indicates two types of knowledge; explicit and tacit knowledge.

Explicit knowledge is knowledge that can be captured, codified, written down and has a high degree of accuracy. Explicit knowledge can be easily communicated and shared due to its formal and systematic language. It can be captured in documents, databases, patents, instruction manuals, written procedures, best practices, lessons learned, research findings, webs, emails and charts (Nonaka 1991; CIO Council, 2001; Tiwana, 2003).

Tacit knowledge, on the other hand, is personal, context specific knowledge that is difficult to formalize, record or articulate and is mainly developed through a process of trial and error encountered in practice (Tiwana, 2003). The employees in the organization are the carriers of tacit knowledge; it is stored in their heads as Tiwana (2003) names it. Tacit knowledge can only be disseminated to other employees by either making it explicit or by social interaction among personnel. This knowledge sharing is defined by Helmstadter (2003, p11) in terms of “voluntary interactions between human actors through a framework of shared institutions, including law, ethical norms, behavioural regularities, customs and so on, the subject matter of the interactions between the participating actors is knowledge”.

Next to different types of knowledge, van Geenhuizen & Nijkamp (1998) distinguish three kinds of knowledge within a private organization: technical, commercial, and management knowledge. Holsapple & Joshi (2002), on the other hand, use the terms descriptive knowledge, procedural knowledge and reasoning knowledge. Descriptive knowledge is revered to information, which describes the state of some world. Procedural knowledge is concerned with how to do something (processes, techniques). Reasonable knowledge indicates what conclusion is valid in a particular situation. However, I do not agree with Holsapple & Joshi. Their ‘types’ of knowledge are not separate types of knowledge; they represent the building block of knowledge. I think that
knowledge is information (descriptive knowledge) used in processes and techniques (procedural knowledge) in order to come to a reasonable decision (reasonable knowledge). Consequently, I will use the types of knowledge indicated by van Geenhuizen & Nijkamp (1998).

The organizations within the programme Space for the River use technical knowledge and management knowledge. Technical knowledge includes knowledge of specialized fields like hydraulics, spatial quality, law, finance and more. Management knowledge includes both controlling and steering of people, as well as the process steps like SNIP2A and SNIP3. They do not use commercial knowledge, because it is a public organization. Instead, I state that they use local knowledge, which implies knowledge of local geographical and political aspects. This kind of knowledge is important for the initiators, because it estimates what is possible and what kind of support they need. The decentralization of the projects emphasizes the importance of local knowledge.

In short, this study will focus on technical, management and local knowledge. All types of knowledge include explicit and tacit knowledge (see Figure 13). The need to exchange these different types of knowledge requires knowledge management. The literature provides many definitions for knowledge management, like those of Huotari & Livonen (2004, p7). They state “that knowledge management involves the management of people as creators of knowledge and the management of information as the raw material of processes related to knowledge creation and production”. Skyrme (1997, p34) introduces knowledge management as “explicit and systematic management of vital knowledge and its associated processes of creating, gathering, organizing, diffusion, use and exploitation of knowledge”. These two definitions are just some examples of the many definitions available. However, most of the researchers and practitioners of knowledge management use the knowledge creation model (SECI) of Nonaka and Takeuchi (1995) as a basic framework for understanding the creation of knowledge. The SECI-model includes the sharing of tacit knowledge by means of personal communication or shared experiences (Socialization), the transformation of tacit knowledge into explicit knowledge (Externalisation), the combination of several knowledge aspects (Combination), which, in turn, results in new tacit knowledge (Internalisation)(see figure 14). In general, most definitions, based on the SECI-model or not, state that knowledge management is a continuous process of creation (or generation), sharing (or dissemination), and exploitation (or utilization or leveraging) of knowledge in a systematic way within an organization and outwards towards stakeholders (Bots & de Bruijn, 2002; Liebowitz, 2005; Cong & Pandya, 2003; Davenport & Prusak, 1998).
The hypothesis, stated in chapter 1, is that the organizations in the programme Space for the River need to share knowledge. This implies that the sharing organization has created knowledge first. Combining different knowledge aspects does create knowledge, which results in new knowledge for an organization. This is an important statement, because it distinguishes knowledge that is new for an organization and new (innovative) knowledge that has never been used anywhere. I assume that sharing knowledge between organizations is to share knowledge that is new for an organization. It seems straightforward, but it implicates that this study must focus on all knowledge (technical, managerial, local, innovative and standard knowledge), because I cannot indicate what is new knowledge for an organization and what is not.

The step after sharing is using the new knowledge, which, ultimately, is essential to attain the goals of the programme Space for the River. Most local governments are not used to managing projects like the projects of the programme Space for the River. They need new knowledge to manage their project effective and efficient. I assume that the organization can use new knowledge in two ways. First, it can apply the new knowledge directly without making any adjustments. Secondly, new knowledge can be transformed and used in the specific local context. It is combined with the local knowledge that an organization has.

The steps before and after sharing knowledge are important for understanding knowledge management in the programme Space for the River. Most scholars state that all three steps belong to the domain of knowledge management. In this research, I will not focus on the process of creating new knowledge and the process of using new knowledge. These processes take place inside the organizations and are different for each organization. A study to these processes is not within the scope of this research.

**4.3) Benefits of knowledge management**

The sharing of knowledge in a systematic way should result in using new knowledge in organizations. It is important to identify the reasons to use new knowledge. Already, it was stated that (new) knowledge could be used for the better good. This section will focus on the possible benefits of knowledge management.

First of all, effective knowledge management should make it possible to select a best practice. This way an organization can minimize reinvention of the wheel, which limits the expenses of trial
and error and reduces project time (De Bruijn & De Nerée Tot Babberich, 2000; CIO Council, 2001; Love et al., 2003). However, sometimes it could be difficult to distinguish who are doing the same and who are not, which increases the costs for identifying and sharing of knowledge (de Bruijn & de Nerée Babberich, 2000). Another reason to not try to prevent the reinvention of the wheel is that this will strengthen the autonomy of local government, because then they are able to do it their own way.

Secondly, knowledge management stimulates innovation by making individuals share their knowledge (CIO Council, 2001; Liebowitz, 2005). This accelerates if knowledge comes from diverse disciplinary perspectives or units (Tiwana, 2003).

Thirdly, not sharing knowledge could result in expertise localization, inconsistent performance across projects, and old practices, methods and processes continue to be inappropriately applied (Tiwana, 2003).

Fourthly, another important aspect covered by knowledge management is the capturing, sharing, and leveraging of knowledge before it leaves the organization (Liebowitz, 2005; Tiwana, 2003). “Retirement of civil servants and frequent transfer of knowledge workers across government departments also create new challenges for the retention of knowledge and preservation of institutional memory and the training of new staff. Thus capturing tacit knowledge and then training the staff is important so that it can be passed on to new staff” (Cong & Pandya, 2003; p29).

At last, knowledge management should result in better quality (Liebowitz, 2005). Organizations retain greater value and are able to make complex, and often irreversible, design decisions quicker and more accurately (Wiig, 2002; Quintas, 1999; Tiwana, 2003).

The literature indicates many benefits of effective knowledge management. However, most studies concern knowledge management in or between private organizations. Most of these organizations want to make profit. Every aspect of knowledge management that contributes to more profit can be seen as effective. For public organizations, like those in the programme Space for the River, knowledge management should result in stakeholder satisfaction (Love et al., 2005). All aspects of knowledge management that contribute to more stakeholder satisfaction can be seen as effective. Profit is a good performance indicator for a knowledge management system in private organizations, but what about measuring stakeholder satisfaction. Who are the stakeholders and when do they think that knowledge management is effective?

The stakeholders in the programme Space for the River are the people that live and work close to the rivers. They are represented by organizations. Most of these organizations are represented either in the Steering Committee (Stuurgroep) or in the Sounding Board Group (KBG). In other words, the stakeholders are the different organizations in the programme Space for the River. As stated before, the effectiveness is defined as the level of user satisfaction about the ability to share knowledge. For each stakeholder, the level of satisfaction to share knowledge is determined by different aspects (stakeholders have different values). This makes it almost impossible to design a questionnaire with all the right question that will address all these possible aspects. Furthermore, some stakeholders will be satisfied with an ineffective knowledge management system, due to strategic reasons. For example, an opponent of a dike relocation could be satisfied with an ineffective knowledge management system if it means that the projectmanagement is incapable of realizing the project properly due to insufficient knowledge. As a result, within this study, the effectiveness will be estimated using an evaluation framework based on knowledge
4.4) A knowledge management system

In order to manage knowledge effectively and systematically, a system is required. According to Cong & Pandya (2003, p30), knowledge management deals with “the people and organisational culture to stimulate and nurture the sharing and use of knowledge; with processes or methods to locate, create, capture and share knowledge; and with technology to store and make knowledge accessible and to allow people to work together without being together”. I assume that these issues are the three elements of a knowledge management system: people, processes and technology. These elements will be discussed in more detail in the following sections.

The most difficult aspect for effective knowledge management, and pointed out by many, is the resistance and reluctance by people in organizations to share knowledge (Tiwana, 2003; McInerney, 2002; Wiig, 2002; Wah et al., 2005; De Bruijn & De Nerée Tot Babberich, 2000). Marqués and Simón (2006) even provide empirical evidence proving that the human dimension is very relevant for developing an effective knowledge management strategy in a questionnaire on knowledge management practices in 222 firms in Spain. Knowledge is often a source of power and people only share knowledge for reasons such as reciprocity, reputation and prestige. However, some share knowledge just for altruistic reasons (Cong & Pandya, 2003; Tseng, 2008). Hoarding of knowledge happens not only by individuals, but in units within an organization as well. Mainly due to a complex and dynamic environment, these units endure a high degree of autonomy in relation to the managerial echelons. The creation of these ‘island empires’ (or silos) together with the ‘language’ barrier prevents transfer of knowledge (American Productivity and Quality Center, 2000; De Bruijn & De Nerée Tot Babberich, 2000; Knight, 1995).

Another reason why people are reluctant to share knowledge has to do with trust. Trust allows people to communicate openly and without fearing that the knowledge shared will be used unethically (McInerney, 2002). This should result in open exchange of information, knowledge and learning, enabling interaction between people and organizations, reducing transaction costs, facilitating economic activities and information technological solutions and enabling work and collaboration both within and among organizations (Sydow, 1998; Scott, 2000; Nooteboom, 2002; Ciancutti & Steding, 2000).

The second element of a knowledge management system is process. It deals with the ability for individuals or units in organizations to share knowledge. Organizations must realize social interaction between people as well as rules of the game for transferring knowledge. For example, the ability to perform work tasks builds trust with the colleagues, which deals with the people element (Wah et al., 2005). Organizations need to invest time and create procedures for people to make tacit knowledge explicit or transferred by social interaction. The lack of opportunities for people to share knowledge is the content of the process element (Cong & Pandya, 2003).

The third element of a knowledge management system is the presence of a good technical infrastructure. Although good information technology is essential for effective knowledge management, it is the least important one in comparison to the other elements (Liebowitz, 1999; Swan et al., 2002; Lapre & Wassenhove, 2001). One must bear in mind that technology is just a crucial enabler. It can help connect people with information, and people with each other, but it is not enough to create an effective knowledge management system on its own (Cong & Pandya, 2003). Without a good IT support system it becomes almost impossible to share knowledge.

The costs of a knowledge management system with its three elements are an important aspect as well. According to Tiwana (2003), setting up a technology infrastructure, cultural change and
employee reward structure could be expensive. The main costs concern with the implementation of the system.

The three elements of a knowledge management system can help to estimate the effectiveness of the system in the programme Space for the River. I assume that if all the elements of a knowledge management system were present and addressed properly, the knowledge management system should be effective. In other words, in order to improve the current knowledge management system, all three elements must be addressed.

4.5) Knowledge management between organizations

The programme Space for the River is a network of organizations, which makes it more complicated to transfer knowledge in comparison to an intra-organizational setting (Riege, 2007). The inter-organizational setting of the programme Space for the River is one organization with many projects on geographically different places. This requires a different approach to knowledge management. Desouza & Evaristo (2004) distinguish knowledge in projects, about projects and from projects. Knowledge in projects is site-specific and not interesting for other projects (local knowledge). Knowledge from projects is insight generated from carrying out the project (technical and management knowledge) and could enhance organizational learning. Therefore, it is important that knowledge management makes knowledge from projects available for other projects in Space for the River. This requires effort, because transferring knowledge between multiple projects at multiple locations is considered to be the most complicated scenario by Desouza & Evaristo (2004). Knowledge about projects like contact information, project-phase and successes could help to transfer knowledge between the organizations of Space for the River. Especially tacit knowledge requires personal contact.

In short, sharing knowledge between the different projects of the programme Space for the River (programme-level) only includes technical and management knowledge, because local knowledge is project-specific and has no value for other projects. Local knowledge has only value for the organizations in the Steering Group or Sounding Board Group within a certain project (project-level).

Furthermore, management of knowledge between organizations has many similarities with management in networks. The PDR (national government) cannot steer local government in a hierarchical matter, it needs their cooperation in order to succeed. It has to operate in a network of organizations, which already have their own network. As mentioned before, it is very complicated to share knowledge in such a context. De Bruijn & ten Heuvelhoff (1999) distinguish four characteristics of a network. First of all, due to the many different organizations (actors), interests, power and other aspects, a network is plural. It demands different expertise to be able to coordinate the whole process, which is impossible to do by one actor (the PDR). Consequently, the actors in the Space for the River are mutually dependent. They need each other to accomplish their goals. Thirdly, actors are sensitive for control signals as long if it fit in their framework of core values. If these control signals from the PDR are contradictory to the core values of local government or other actors, these actors can ignore the signals. A fourth and last characteristic of a network its dynamic nature. The positions of actors change constantly, which results in new mutual dependencies. These four characteristics will affect the sharing of knowledge between the organizations of Space for the River, especially on project-level, because local stakeholders have more opposing interests than the projectmanagers on programme-level. Therefore, it is important that a knowledge management system is varied and accommodates everybody’s needs. Additionally, all organizations must share knowledge, because they are mutually dependent. The content of the knowledge management system will change constantly, resulting in new connections...
between organizations all the time.

Management in a complex network needs process management; otherwise strategic behaviour will result in inefficiency. One scenario in a knowledge management system is that some actors only extract knowledge and do not give knowledge to others. This behaviour will demotivate others to share knowledge and in the end the system will not function anymore. The reasons for strategic behaviour were described in section 4.3. De Bruijn, Ten Heuvelhof and In 't Veld (2002) have made a set of process rules that can be used for knowledge management. The process rules apply to decision-making in complex networks. Although knowledge sharing is not the same as decision-making, some process rules could help to prevent strategic behaviour, for example, rules about joining and leaving the system (entry and exit rules). The number and kind of rules depends on the complexity of the network of the knowledge management system.

In other words, process management is part of the knowledge management system. It deals with the different aspects (especially strategic behaviour) that make a network, like the organization in the programme Space for the River, complex.

4.6) Conclusion Theory

This chapter has discussed the role of knowledge in the programme Space for the River. The findings in the literature of knowledge management support the hypothesis that it is essential for the success of the programme Space for the River that the different organizations exchange knowledge. Although most literature focuses on knowledge management in or between private organizations, all scholars, including those who have included public organizations in their research, state that knowledge management is becoming more and more important. The evaluation will test the hypothesis empirically.

Furthermore, I established the different aspects of knowledge management that will be used to estimate the effectiveness of knowledge sharing between the organizations of the programme Space for the River. Still, it is possible that some aspects of knowledge management have not been mentioned in this chapter. Therefore, more literature will be discussed during the evaluation and the design of the knowledge management system.

For the evaluation, I will try to establish a framework for estimating the effectiveness of the current knowledge management system. This framework should include performance indicators and norms that can be used to test this effectiveness. The identification of these performance indicators and norms will be based on more scientific literature. It will be discussed in section 5.3.

The design of an effective knowledge management system is partly based on literature as well. The evaluation will show which elements should be addressed. The different elements that will be part of the system are based on scientific literature and translated in the context of the programme Space for the River. This will be discussed in chapter 6.
5) Evaluation

5.1) Introduction
The evaluation starts with the hypothesis that sharing knowledge between the organizations (i.e. different governments) in the programme Space for the River is essential. The literature study in chapter 4 provided a first support for this hypothesis. The evaluation will try to find more support by estimating the effectiveness of the current knowledge management system. If the system is ineffective and the programme is nevertheless attaining its goals, the hypothesis is falsified. However, at the moment (2007) it is impossible to predict the results in 2015. This makes full corroboration of the hypothesis at this moment impossible. Still, by linking up the effectiveness of the current knowledge management system with the results so far, the evaluation should provide some support for the hypothesis (or not and is falsified).

The estimation cannot be done statistically as concluded in section 4.3, due to limited organizations and the inability to create a questionnaire that addresses all the different aspects, which determine the satisfaction of all stakeholders. Therefore, a new evaluation framework will be used based on existing knowledge management theory. The development of this evaluation framework is an important part of this chapter.

Section 5.2 describes the method that is used for the evaluation of the knowledge management system as well as the demarcation of the evaluation. Section 5.3 discusses the development of the evaluation framework. The case studies are addressed in section 5.4. The analysis of the case studies are done in section 5.5. Section 5.6 includes the results of the evaluation. Section 5.7 reflects on the consequences of these results.

5.2) Method and demarcation

Method
The evaluation consists of a number of steps. It starts with the identification of an evaluation framework that indicates what to look for when gathering data. The evaluation framework comes from scientific literature, but is subjected to a critical look of two knowledge managers, who have a lot of experience with knowledge management. The second step is to select the case studies that will be subjected to the evaluation. The characteristics of the case studies should match the selection criteria as set in chapter 3.3. Data is gathered by means of desk research and interviews with the different organizations (in the case studies, but other project managers as well). The analysis discusses the data and places them in perspective. The results should indicate the weak and strong points of the current knowledge management system. Important are the consequences of the results for the hypothesis as well as for the improvement of the current system. The different steps of the evaluation are found in figure 15.

Figure 15: Evaluation method
**Demarcation**

It is important to establish the scope of the evaluation, because it determines what kinds of aspects are included. Consequently, the scope determines the usability of the outcomes as well.

First of all, the evaluation will focus on the programme Space for the River only. It will not use information of other similar programmes to estimate the effectiveness of the current knowledge management system, because the project-structure of the programme Space for the River is pretty unique in the Netherlands. This has been the reason to investigate knowledge management in the first place.

Secondly, the demarcation concerns the different levels of knowledge management. Already, the literature study distinguishes knowledge in projects, about projects and from projects (Desouza & Evaristo, 2004). In line with these findings, I distinguish the following levels:

I. Knowledge exchange between members of the project team,
II. Knowledge exchange between the stakeholders (including the project team) of a project,
III. Knowledge exchange between the projects in the programme Space for the River and the PDR as well as mutually
IV. Knowledge exchange between knowledge institutes and other infrastructure projects

The first level includes knowledge exchange in a (small) project team. I assumed that these people work in the same building and communicate on a daily basis. Knowledge management is simple and knowledge is exchanged between team members effectively. This includes the PDR as an organization as well.

The second level shows knowledge management between the different stakeholders of a project. These stakeholders are often different organizations that meet with each other periodically. Most have different interests and could behave strategically, which implies that knowledge exchange is not natural. Organizations on project-level include DGR, municipalities, provinces, waterboards, national interest organizations and local organizations. Often, some representatives know each other from other projects, which could increase or decrease knowledge exchange, depending on the successfulness of the previous cooperation.

The third level includes the different projects of Space for the River as well as the PDR. They are geographically scattered throughout the Netherlands. Most projectmanagers do not know each other. This situation needs a good knowledge management system to facilitate knowledge sharing between the different projects. It is an important level, because the projects could learn about many knowledge subjects if they exchange knowledge with each other. The PDR has to monitor the programme’s progress by checking the status of the projects periodically. Additionally, they have to exchange knowledge as well with the projects considering their facilitating role. Consequently, they have to exchange knowledge with many different organizations, which requires a good knowledge management system.

The last level is knowledge exchange with the organizations that are not included in the programme Space for the River. It includes organizations like universities and other infrastructure projects. This level includes an extensive network throughout the Netherlands, because there are many connections between organizations (governmental or private) in the programme and outside the programme. These organizations exchange knowledge, which they use for their own project or research.
The different levels are shown in see figure 16.

The research questions indicate that this research focuses on knowledge management between organizations of the programme Space for the River. The members of a project team are an organization itself and this level will not be included in this evaluation. The same applies to level 4. Knowledge institutes of other infrastructure project are not part of the programme Space for the River and are excluded.

In conclusion, the evaluation will focus on the effectiveness of knowledge exchange between stakeholders of a project (project-level) and between the different projects in Space for the river (programme-level). No other programmes or external organizations are included in the evaluation as well.

5.3) Evaluation framework
Due to the impossibility to use user satisfaction as a performance indicator for an effective knowledge management system, other performance indicators are needed. A way to indicate how effective a knowledge management system is is to measure the direct results of that system, because these results determine the success of the programme Space for the River. The results of an effective knowledge management have been described in section 4.2:

- Less expenses of trial and error (euro/project)
- Reduction project time (months/project)
- Improved quality (scale 1-10)
- More innovation (# of innovations)
- Etc.

Although these are straightforward indicators of effective knowledge management, they are difficult to measure. First of all, these results are influenced by many other factors like organizational structures, responsibilities, capacities, civil servant personal expertise and otherwise available intellectual capital (Wiig, 2002). These other factors that influence aspects like innovation make it difficult to estimate the exact contribution of the knowledge management system. Figure 17 shows these influences. A ‘+’ indicates a positive correlation and a ‘-’ a negative correlation between two factors. For example, a more effective knowledge management system should result in fewer costs (a negative correlation) and it should result in a better planning (positive correlation). The exact correlation of the other factors (organizational structures, available intellectual capital and communication technology) is unknown. Another problem is that these results themselves are difficult to measure. For example, Reduction of project time is a clear indicator, but is difficult to measure, because it is difficult to know what the project time would be without effective knowledge management. Liebowitz (2005) underlines the difficulties with establishing performance indicators. He states that returns of investment for knowledge management efforts are difficult to calculate, because organizations have difficulties assigning a monetary value to knowledge. Few
organizations have been able to establish a causal relationship between knowledge management activities and firm performance (Marqués & Simón, 2006). This is supported by Osterloh & Frey (2000), by explaining the complications around implementing a reward system for sharing tacit knowledge. Tacit knowledge cannot easily be observed or attributed to an individual. Still, an increasing number of organizations seek to measure knowledge directly (Fahey & Prusak, 1998). They are using performance indicators like the quality of databases, the number of requests pertaining to intranet or the number of knowledge projects. These performance indicators do not provide any sense of an organization’s performance in correlation to knowledge management. Therefore, many believe that performance indicators should be soft and non-financial (Webber, 1997; Holsapple & Joshi, 2002; Fahey & Prusak, 1998). Still, Hiebeler (1996) has indicated that no other knowledge management area is as under implemented as measurement. Especially for public organizations, the scientific literature provides no clear performance indicators at all.

Another problem is the difficulties with the norms of effective knowledge management. Imagine that it was possible to estimate the contribution of knowledge management to aspects like innovation or costs. What scale should be used for effectiveness and when is a knowledge management system 100% effective? For private organizations, estimating the level of effectiveness is considered simpler than for public organization, because for them, profit is often a good and clear norm. For example, if a private organization wants 10% more turnover and the implementation of a knowledge management system results in this, this system could be seen as 100% effective. Although non-financial factors are becoming more important, profit will stay the most important factor. In public organizations norms for effectiveness are determined by many aspects (financial and non-financial). The reason is that public organizations have multiple stakeholders to satisfy. Often, stakeholders have different and sometimes contradicting interests. Consequently, the effectiveness of a knowledge management system is determined by multiple norms. The scientific literature doesn’t provide these norms, because each situation requires a different set of norms (Riege, 2007).

The inability to measure the contribution of knowledge management in the success of the programme Space for the River and the lack of norms for the level of effectiveness of a knowledge management system in public organizations demands a different approach.
In section 4.4 I stated that a knowledge management consists of three elements: people, process and technology. These elements should be addressed properly for a knowledge management system to be effective. Since it is impossible to measure the results of a knowledge management system, it is helpful to look at the conditions for an effective system. The design of a knowledge management system should be done according to certain design principles. These design principles are categorized in three elements of a knowledge management system. The identification of these design principles should be done according the context of the system, because each situation requires a different set of design principles (Riege, 2007). This new approach can be seen in figure 18.

![Figure 18: New approach evaluation](image)

This seems a workable approach. The literature provides much more information about design principles of a knowledge management system than about performance indicators. A lot of scholars have done empirical and statistical research to knowledge management and provide design principles accordingly. However, the appropriateness of the design principles is determined by the context of the knowledge management system. In other words, the context must be identified first before searching in the literature for the right design principles.

⚠️ The new approach incorporates two assumptions:

- Using the characteristics of the context, all important design principles can be identified.
- If all design principles of a knowledge management system are addressed properly, spread over the elements people, process and technology, the system is effective.

The assumptions start with the characteristics of the context. What are these characteristics and how do they determine the design principles? In section 4.5 it was stated that network management is important for knowledge management due to strategic behaviour of stakeholders. Therefore, the four characteristics of a network (plural, mutual independency, core values and dynamics) determine the context. Another important characteristic is the number of stakeholders. A large group of stakeholders makes knowledge management more complex in comparison to a small group. On the other hand, more stakeholders imply more knowledge to share. A third characteristic of the context is the organizational setting. As indicated in section 4.5, an inter-organizational setting is more complex than an intra-organizational setting. A fourth characteristic is the type of organizations. The fact that an organization in an intra-organizational setting is
private, public or social determines the core values and goals of an organization. In an inter-
organizational setting it is important to know if all organizations are private (like a consortium),
public (like a Steering Group), social (like a environmental organization), public-private (like a
Public Private Partnership) or public-private-social (like a Sounding Board Group). A combination
of private organizations has competitive-issues and a combination of public organizations have
political issues to consider. Another important characteristic of the context is the kind of product.
In other words, what should be the endresult? This could be a decision, a design, a strategy,
etc. The kind of product determines how stakeholders will behave or which stakeholders should
be included. All these characteristics determine the type of context (see figure 19), although
it is possible that not all characteristics are determined. Still, I assume that the four identified
characteristics are sufficient to determine the context of the knowledge management system.

The next step is to identify the design principles using the context. The assumption is that all
important design principles can be identified. In this research, the design principles are selected
from the existing literature of knowledge management in combination with literature that
is applicable to the context and with help from experts in this field (experienced knowledge
managers). With this, I assume that the literature study and the interviews with knowledge
managers provide sufficient data to identify the most important design principles on project-level
and programme-level.

The second assumption deals with the level of effectiveness of the knowledge management system.
The assumption states that if all design principles are addressed properly the system is effective.
But what if just 90% of the design principles are addressed properly? Is the system then ineffective
or effective enough? The answer depends on the use of the evaluation framework. In my opinion,
the framework can be used for:

- A manager tool to report the effectiveness to upper management
- A knowledge-manager tool to identify the strong and weak aspects of the current
  knowledge management system

The first application implies that upper management wants to know the effectiveness of the
current knowledge management system as input for strategic development. They could argue that
a system that is 90% effective is effective enough and doesn’t need additional improvements (i.e. financial input). The estimation of the exact level of effectiveness needs additional research. Consequently, the current system needs to be compared with other knowledge management systems in the same context.

The second application entails that the evaluation framework can be used to indicate what kind of improvements the current knowledge management system needs. In other words, it is less important to indicate the exact level of effectiveness.

The second research-goal of this study is to design an improved knowledge management system if needed. The PDR (i.e. upper management) have already decided that the system should be improved by the introduction of an extranet, which will be discussed in chapter 6. In other words, the evaluation framework will be used in order to identify the weak points of the system that need improvement. This makes additional research to other knowledge management systems in the same context superfluous and will not be done in this study.

The next section will use the evaluation framework to identify the type of context on project and programme-level. In addition, by using scientific literature and the knowledge of knowledge managers, the design principles are identified and sorted in the people, process and technology elements.

5.3.1) Design principles for a knowledge management system on project-level
The context of the programme Space for the River on project-level is characterized by the inter-organizational setting of public, social and private organizations. Each project has a Steering Committee (SG), a Civil Servant Group (ABG) and a Sounding Board Group (KBG). In the SG and ABG, most members are representatives of a government (national, regional or local) and hence public organizations. In the KBG, the organizations are mainly social and private including organizations like local inhabitants, environmentalists, private companies and more. The number of organizations in this network (i.e. stakeholders) depends on the social impact of a flood prevention measure. A big social impact means that many stakeholders are affected by the flood prevention measure and to attain a high quality of policy proposals, the interest of all parties should be involved as much as possible, and as efficiently as possible (Enserink & Monnikhof, 2002). In other words, the required number of stakeholders in the SG, ABG and KBG will be bigger if the social impact of a flood prevention measure is big. In most of the projects, the social impact is big and hence the context is characterized by a large number of people. In total, the number of organizations on project-level is approximately between 10 and 20 organizations, which means that many people deal with the process (2 or more per organization)

The network on project-level includes stakeholders that have different interests (environmental, economical, safety, etc.), which makes it a plural network. Additionally, in order to gain enough support for the implementation of the flood prevention measures, it is essential that important stakeholders participate in the decision-making process. In other words, these stakeholders become mutually dependent. They need each other’s support as well as (local) knowledge to attain a high quality of policy proposals. Another aspect of this network is its dynamics: representatives of stakeholders change, stakeholders switch to pursuing other interests, or stakeholders leave and enter the network. All this will result in strategic behaviour.

In short, the characteristics of the context on project-level are:

• Inter-organizational
• Public, private and social organizations
• A large number of stakeholders
• The product is a design that has enough support
• The network is complex
  • Many different interests
  • Stakeholders are mutually dependent
  • The network is dynamic

These characteristics create a context where a large number of public, private and social organizations with different interests have to work together in order to come to a design about a flood prevention measure that has enough support. In order to identify the interests of all the different organizations, public participation is essential (Pahl-Wostl, 2005). Even more, it is required in River Basin Management according to the European Water Framework Directive. Social learning is to be of paramount importance to collective decision-making and hence public participation (Pahl-Wostl, 2005; Mostert et al., 2007). Social learning refers to the growing capacity of a social network to develop and perform collective actions (Maurel, et al., 2004; Craps, 2003). The process of social learning involves engaging in collective learning processes (Pahl-Wostl, 2005). Therefore, the knowledge management system on project-level must enhance the social learning process.

⚠️ In short, a knowledge management system must stimulate social learning within the project. I will focus on the ABG and KBG, individually as well as together. In order to identify the design principles, I will use the three elements of a knowledge management as a guideline.

People
Experts in the ABG have a different background in comparison to the people in the KBG. Often, experts are unwilling to cooperate with non-experts (Enserink&Monnikhof, 2003). Therefore, all stakeholders must realize their interdependence and must think that participation in the process can yield better results than unilateral action (Mostert et al., 2007; Pahl-Wostl, 2005). To change their attitude and behaviour, a knowledge sharing culture need to be created. Cong and Pandya (2003) state that the knowledge management measures are to build an environment of trust, to raise awareness of the benefits of knowledge sharing and to establish a formal rewards and recognition system for knowledge sharing.

Individuals are more likely to share knowledge with another whom they feel comfortable with or whit whom they share personal interests (Wah et al., 2005). Trust is gained in collaboration among stakeholders. Therefore, it is important to facilitate this social interaction by organizing face-to-face communication (Wah et al., 2005).

In order to raise awareness of the benefits of knowledge sharing, the first step is support of project management. Knowledge management should be aligned and integrated with the strategic goals of the project. (Liebowitz, 2005; Chourides et al., 2003; Cong & Pandya, 2003). Without broad agreement on concepts, knowledge management will not be effective (Wiig, 2002). Additionally, it will clarify the role of the KBG (decision power or consultation), which is needed to prevent disappointment about their input (Mostert et al., 2007).

Rewarding stakeholders (especially in the ABG) for sharing knowledge results in recognition (Wah et al., 2005). Additionally, celebrating success stories and propagating tales of knowledge sharing will encourage other stakeholders to engage in knowledge sharing as well. Another way to create a knowledge management culture is to share problems, errors, successes and disasters instead of
penalize or hide them (Cong & Pandya, 2003; Liebowitz, 2005; Tiwana, 2003).

Design principles:
- The stakeholders of the ABG and KBG have face-to-face communication
- Project management has explicit knowledge management goals
- Stakeholders of the ABG and KBG are rewarded for knowledge sharing

Process
This element concerns the ability for stakeholders to share knowledge. Most knowledge is tacit and can only be transferred by interaction. Interaction among stakeholders is an essential ingredient of social learning (Mostert et al., 2007). Interaction can be realized by group meetings, bilateral meetings, or by phone. To increase the ability to share knowledge, the ‘translation problem’ must be overcome (Enserink & Monnikhof, 2003). The stakeholders in the KBG must be able to understand the knowledge of the experts in the ABG. Therefore, information about the different people, processes and methods must be clear to everybody in the participation process.

Design principles:
- The stakeholders know the appropriate contacts of other stakeholders
- The stakeholders know each other’s core values and interests

Technology
Effective communication is essential, because social learning can be time-consuming due to an increasing number of interaction and the difficulties to combine expert and non-expert knowledge (Pahl-Wostl, 2002). Therefore, it can be helpful to use an information and communication tool (IC-tool). For the projects I assume that a database can help to exchange documents. Morici et al. (2003) distinguish different levels of access to a knowledge management system. For the projects, it can include a public level (website) and a registered level (password on a website).

Design principles:
- The stakeholders have a common database
- The project has a public website

Knowledge management experts
The findings in the literature have been discussed during interviews with drs. Msc. I. Roos and Ir. H. Verkerk (see Appendix C). Roos is knowledge manager at the section Innovation and Development of the Bouwdienst, DGR. Verkerk is head Knowledge Management at the programme Maaswerken, a similar programme like the programme Space for the River. They both stipulate the difficulties of evaluating knowledge management. Roos confirms that every situation asks for different knowledge management systems and the aspects that are easy to measure are not likely the best indicators of success. However, she managed to come up with some extra design principles (see list below). Verkerk indicates that knowledge management depends on the person. They have to accept that they don’t know everything and that they should learn from each other by exchanging knowledge. The design principles as identified by the knowledge managers are included in one of the elements of a knowledge management system.

Design principles:
- The stakeholders encounter no problems finding knowledge at other stakeholders (people element)
- During meetings there is an open atmosphere of knowledge sharing (process element)
5.3.2) Design principles for a knowledge management system on programme-level

On programme-level, the context has an inter-organizational setting, but now only with public organizations (the PDR and initiators). For many initiators (i.e. project-teams) the management of a project like the design of a flood prevention measure, with aspects like public participation, is new. The organizations are doing, in principle, the same and can enrich their own project by exchanging knowledge. These organizations have the same interest, and only profit from knowledge sharing. Additionally, they are not mutually dependent, which makes this network simple to manage. For example, the project-team of the Municipality Zwolle does not need the project-team of the Province Gelderland to manage their project. On the other hand, they can help each other by exchanging knowledge. At the moment, there are approximately 16 project-teams, which include 3 to 10 team-members. Together with the people at the PDR, the number of people that could profit by sharing knowledge is quite big.

In short, the characteristics of the context on programme-level are:

- Inter-organizational
- Public organizations
- A large number of stakeholders
- The network is not complex
  - Same interests
  - Stakeholders are not mutually dependent
  - The network is dynamic
- The product is to create a network that can be used to retain knowledge

The projectmanagers and people of the PDR form a ‘Community of Practice’ (CoP). CoP’s are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly. A CoP is characterized by mutual engagement, shared repertoire, and joint enterprise. Without these characteristics, a self-sustaining learning community will not come into existence (Wenger, 1998). Therefore, the knowledge management system must stimulate the characteristics of a CoP. Again, I will indicate for each element of the knowledge management system, which design principles should be chosen for the knowledge management system to be effective.

In short, a knowledge management system must facilitate a CoP on programme-level. I will focus on the different project-teams and the PDR as organizations. In order to identify the design principles, I will use the three elements of a knowledge management as a guideline.

People

A community of practice exists because it produces a shared practice as members engage in a collective process of learning (Wenger, 1998). This shared practice must be clear to all members; the projectmanagers and people of the PDR. Therefore, it is important to identify the information that the projectmanagers need. Another important aspect of a CoP is a sense of trust across the projectmanagers. The community must create conditions that will indicate the trustworthiness and commitment of members towards other members (Lesser & Prusak, 1999; Lesser & Storck, 2001). The building of trust, as stated before, is done by face-to-face communication (Cong & Pandya, 2003).

The sharing of knowledge in a CoP happens, because its members acknowledge the benefits.
However, people can participate in different ways and in different degrees (Wenger, 1998). In order to stimulate participation a reward system can be developed. This includes rewarding project managers on individual basis or as a community. Another stimulation to participate is providing resources, such as outside experts, travel, meeting facilities and communication technology (Wenger, 1998).

A CoP can help to identify the best practices that enable members to use the best knowledge for their own project. Therefore, it is important that best practices are identified, discussed and shared with the project managers (Marques & Simón, 2006).

Design principles:
- Tasks are established to identify the information resources necessary for the organizations
- The project managers have face-to-face communication
- The PDR informs of and rewards collaborators’ achievements
- There are incentives to achieve the overall aims of the programme Space for the River
- Best practices in one project are shared with other project managers

Process
The members must be able to share knowledge with each other. Especially in geographically dispersed projects, CoP’s are challenged and constrained by the lack of opportunity to make direct connections to share knowledge. “If people meet each other it enables them to more quickly build a network of contact, foster interaction that allows for trust building. Without face-to-face encounters, the process of community building becomes less effective” (Lesser & Prusak, 1999, p6). The condition the project managers have face-to-face communication is already established at the people element.

Technology
A way to facilitate a CoP is the development of shared repositories. In these shared spaces, the project managers can evaluate who is making contributions to the knowledge pool. This can create a sense of mutual trust. Another technique that facilitates CoP is a technology that makes it easier to find and contact fellow community members (Lesser & Storck, 2001). The knowledge management system should include a kind of extranet where the project managers can exchange documents and find contact information of other project managers. CoP’s should classify and organize all documents that are shared in order to establish a common mechanism for structuring and storing the collective memory of their members (Lesser & Storck, 2001).

Design principles:
- The project managers and PDR have a common database (extranet).
- There is a system to codify explicit knowledge

Knowledge management experts
Supporting the condition Mechanisms are in place to encourage the members of organizations to share information, Verkerk points out that the Maaswerken, a similar project like Space for the River, has no knowledge management system. The project-managers are very busy with their deadlines and it is not their priority to learn from other projects. This resulted in isolated projects that sometimes don’t even know that other projects were working in the same area. This is proof that much is to be gained by nurturing a CoP with the project managers of Space for the River. Some remarks of Roos and Verkerk mentioned earlier are applicable on programme-level as well. The design principal as identified by the knowledge managers is included in one of the elements of a knowledge management system.
Design principles:
- Project managers have difficulties of acquiring knowledge from other project managers or PDR (people element)

5.3.4) Conclusion Evaluation Framework
The inability to measure the results of a knowledge management system has driven the search for a new approach to estimating the effectiveness of a knowledge management system in the programme Space for the River. The new approach uses design principles as proxies for the effectiveness. A proxy or proxy indicator is an indirect sign that approximates or represents a phenomenon in the absence of a direct sign (www3). If a knowledge management system has addressed all design principles properly, the system is seen as effective. The design principles are determined by the context of the knowledge management system. On project-level the context is a social learning process and on programme-level the context is a Community of Practice (see figure 20).

![Figure 20: Conclusion Evaluation Framework](image)

However, this research does not provide any proof that the evaluation framework is a good approach to estimate the effectiveness of a knowledge management system. Even more, it is at this stage impossible to indicate an exact level of effectiveness due to insufficient data. The new approach can be used, on the other hand, to indicate weak and strong aspects of the current knowledge management system. But, even for this purpose, the identification of the context and the design principles is not without risks. For the match between the characteristics of the context and the type of context, as well as the identification of the design principles using the literature and the experience of some knowledge experts, no criteria have been used. In other words, the assumption that all relevant design principles can be identified using the context depends on the fact that the right context is identified and that the literature have provided all relevant design principles. Still, for this research, the use of the evaluation framework is justified by the fact that it is used as an input for the design of an improved knowledge management system. Consequently, additional input is required for the design in chapter 6.
5.4) The case studies

The evaluation will be done on project-level and programme-level. On project-level, some stakeholders in the case studies can be limited to provide sufficient or true information due to strategic behaviour or diplomatic subjects. Therefore, it is essential to interview multiple stakeholders in order to guarantee some kind of quality of the results. Additional information comes from reports, websites, and articles about the case studies. The selection of the case studies is done according to the criteria set in section 4.2. From the possible project, I choose the projects:

- Uiterwaardvergraving Scheller and Oldeneler Buitenwaarden
- Uiterwaardvergraving Honswijkerwaarden, Stuweiland Hagestein, Hagesteinse uiterwaard en Heerenwaard (In short: project Vianen)

Both include lowering of river floodplains and have a contract, but one project has just started, while the other has already made a selection out of 3 alternatives (SNIP2A). In addition, both have different types of governments (a province and a municipality). This makes it interesting to identify if these different local governments communicate and exchange knowledge on programme-level. An elaborate description of both case studies is found in Appendix B: case studies. It seemed wise to include the Riviertakmanager of the PDR, the projectmanager, members of the ABG and members of the KBG. The Riviertakmanager can indicate the problems from the point of view of the PDR. The projectmanager knows almost everything. The members of the ABG or KBG are able to tell what is happening during their meetings and about other aspects. However, at the moment of this research, the KBG in the project Vianen was not operational yet. The stakeholders are selected randomly. In total, five stakeholders for each case study. The following stakeholders have been interviewed in the case studies:

**Project Scheller and Oldeneler Buitenwaarden**
- Municipality Zwolle (Projectmanager)
- PDR (Riviertakmanager)
- Waterschap Groot Salland (ABG)
- Staatsbosbeheer (KBG)
- Buurtschap IJsselzone (KBG)

**Project Vianen**
- Province Utrecht (Projectmanager)
- PDR (Riviertakmanager)
- Hoogheemraadschap De Stichtse Rijnlanden (ABG)
- Municipality Nieuwegein (ABG)
- Municipality Vianen (ABG)

On programme-level it is necessary to interview multiple projectmanagers. During these interviews, they were asked about the status of knowledge management within their project as well. Hence, the information for knowledge management on project-level is not limited to only the case studies. This makes it possible to verify the results of the case studies with the other projects. Consequently, the generalization of the results on project-level is considered appropriate. Also on programme-level, some people of the PDR have been interviewed, because the PDR is considered an organization as well. They have to be able to share knowledge as well. The following projectmanagers and PDR-units have been interviewed:

**Projectmanagers**
- Floodplain adjustment Scheller and Oldeneler Buitenwaarden
- Floodplain adjustment Vianen
- Bypass Veessen-Wapenveld
- Floodplain adjustment ‘De worp’
- Dike relocation Cortenoever and Voorster Klei
- Dike relocation Lent

**PDR**
- Knowledge Unit
- Riviertakmanagement
- Project Control Unit
All interviews were face-to-face and had a semi-structured nature, which is one of the most common approaches to interviewing in qualitative research (Bryman & Burgess, 1999). Each interview was summarized and sent to the interviewee for validation. The validated summaries can be found in Appendix C: summary interviews.

5.5) Analysis
The analysis is divided in knowledge management on project-level and knowledge management on programme-level. Information came from reports, brochures, and interviews (see Appendix C: summary interviews for all interviews)

5.5.1) Analysis knowledge management on project-level
The interviews with the stakeholders of the two case studies provided a good overview of the situation, because different points of view were taken into consideration. The questions for the project managers of other projects were limited, because I could only hear their side of the story. The analyses of the design principles are categorized (see Appendix D: analysis evaluation). The next section summarizes these findings.

1) Stakeholders of the ABG and KBG have face-to-face communication
Face-to-face communication usually takes place during the meetings of the ABG or KBG. The frequency of the meetings varies between every 2 weeks to 6 times a year. In general, the stakeholders of the ABG see each other more often than the stakeholders of the KBG. However, not all projects have a KBG. At the start of the project, some had a fieldtrip to get to know the project and the other stakeholders. Contact between ABG and KBG stakeholders is rare. Often, the chairman represents the KBG at the meetings of the ABG (or Steering Group). Some local organizations complain about the knowledge gap between the KBG and the members of the ABG. Next to face-to-face contact, most stakeholders e-mail each other.

2) Project management has explicit knowledge management goals
Almost no project has explicit knowledge management goals, but some have systematic actions that stimulate knowledge exchange. One project calls stakeholders frequently to ask if they need some information. Another project is done by a consortium of engineering firms, which have to share knowledge with the members of the ABG. One project wants to spend 50% of its time for gathering knowledge from other projects in Space for the River.

3) Stakeholders of the ABG and KBG are rewarded for knowledge sharing
Occasionally, some projects publish a newsletter or brochure. The content is mainly about the successes of cooperation between local stakeholders and government. It indicates indirectly who has contributed to the project. Still, it is hardly a reward. Furthermore, no project has rewarded stakeholders for knowledge sharing explicitly.

4) The stakeholders know the appropriate contacts of other stakeholders
Yes, all members of the ABG and KBG have contact-information of other stakeholders. If not, they can contact the project manager who will provide them with a phone number or e-mail address.

5) The stakeholders know each other’s core values and interests
As a test, the stakeholders of the case studies had to state the core values of another stakeholder.
It seemed that most stakeholders are well aware of the core values and interests of others. Some could not tell every core value, because the representative was new to the project. Remarkable is that some ABG members don’t know anything about the core values of the organizations in the KBG.

6) The stakeholders have a common database
Most of the projects have no common database. Instead, they exchange documents per e-mail or during meetings. In one project, the ABG is the project team, which has an intranet. Other projects are starting and did not think about it yet.

7) The project has a public website
Many projects have a public website. They inform the public about what is going to happen and who is involved. In my opinion, the websites are informative and precise; they are a good way to inform the public. Most sites indicate whom to contact for more information.

8) Stakeholders encounter no problems finding knowledge at other stakeholders
The members of the KBG at Scheller and Oldeneler Buitenwaarden indicated the knowledge gap with the members of the ABG. They have to formulate an advice with information that has few details or is not understandable (too technical). The members of the ABG have no difficulties with acquiring knowledge from other members of the ABG.

9) During meetings there is an open atmosphere of knowledge sharing
In general, the meetings of the ABG are open and people are sharing knowledge. At some projects, some stakeholders have little input or meetings were to abstract and informative. All stakeholders of the ABG that I spoke to, indicated the open atmosphere during the meetings. However, self-reflection is difficult and people will not easily speak negative about their own performance. Fortunately, I have attended a meeting with the ABG of project Vianen and can confirm that everybody was willing to share knowledge. It seemed that there is a culture of knowledge sharing within the ABG. The meetings of the KBG were very difficult on the other hand. Some local organizations are hostile and show little cooperation resulting in less knowledge sharing.

5.5.2) Analysis knowledge management programme-level
Again, the scores on the different design principles are categorized (see Appendix D: analysis evaluation) and summarized in the next section.

1) Tasks are established to identify the information resources necessary for the organizations
The PDR has appointed a knowledge broker that is responsible for providing projectmanagers and people of the PDR with the necessary information resources. She tries to link the people or projectmanagers with knowledge questions to people that posses that knowledge. However, many projectmanagers don’t know this. Additionally, contact between projectmanager and PDR goes through the riviertakmanager, which is an extra obstacle for knowledge exchange.

2) The projectmanagers have contact with each other
The PDR organizes a projectmanagers meeting day approximately 4 times a year. During this day, people of the PDR or projectmanagers give presentations about different aspects. During this day, projectmanagers get to know each other and exchange knowledge. It is the only official platform for the projectmanagers to exchange knowledge. However, occasionally, some projectmanagers have contact by phone or e-mail. Mainly, they exchange documents that should be delivered to the PDR, because for most projectmanagers it is not clear how and what information the PDR wants. Contact between the projectmanagers and the PDR is done by Riviertakmanagers. They are responsible for communication between projectmanager and the people at the different units at
the PDR (Knowledge Management, Communication or Project Control).

3) The PDR informs of and rewards collaborators’ achievements
The success stories of project managers that exchanged knowledge and resulted in innovation or other benefits are unknown. The PDR has a newsmagazine, but the target group are mainly local inhabitants of the different projects. This newsmagazine does not mention the successes of cooperating projects. Furthermore, there is no reward for joint achievements.

4) There are incentives to achieve the overall aims of the programme Space for the River
At the moment, the project managers or people at the PDR do not get a bonus or something else for achieving a good result together. Probably, the main reason is the long lead-time towards the deadline of 2015. Recently, some projects presented designs with costs lower than the available budget. These initiators were arguing that they want to use the rest of the budget for extra facilities within the project, facilities that are not within the scope of the programme Space for the River. This issue is incorporated in the contract (“Bestuursovereenkomst”), although it is unknown what kind of an award that will be.

Besides being the monitor, the PDR has a facilitating role. Still, project managers complain about the difficulties of getting certain information (tendering, hydraulics, natura-2000, etc) from the PDR. Consequently, the project managers have to search for this knowledge elsewhere, which consumes a lot of time. From observations, I confirm that most people of the PDR are busy working for the PDR instead for the project managers. Some project managers question the legitimacy of the PDR if they are not capable of facilitating the projects. From these observations, it can be concluded that the PDR has almost no mechanisms in place to encourage knowledge exchange with the projects besides the project managers meeting day.

5) Best practices in one project are shared with other project managers
The projects are in different phases. Some started construction and others just signed their contract with the PDR. Currently, the PDR does not distinguish best practices openly. Sometimes the PDR distributes a report of a project as an example that has done well. Most of the time, the project managers have to judge for themselves when another project has done well or not. Often, this can be done during the presentations and discussions during the project managers meeting day.

6) The project managers and PDR have a common database (extranet)
There is no common database that is accessible for all project managers. Documents are sent by e-mail, cd-rom or mail. The website is brand-new and contains a lot of information. Furthermore, some projects have their own websites with information. The PDR has an intranet, but is currently not used a lot.

7) There is a system to codify explicit knowledge
Each quarter, the projects have to inform the PDR about their progress and current situation. The different aspects are bundled in a report according to a format set by the PDR. This is a kind of system to make certain tacit knowledge explicit. These documents and documents produced by the PDR are stored on a common hard drive (in the Hague). However, the documents are stored at random and the hard disk has become a monster, where it is very difficult to find information. Fortunately, the PDR is implementing a system that codifies and stores documents logically in order to get an archive that is easily accessible.

8) Project managers have difficulties of acquiring knowledge from other project managers or PDR
Most project managers have contact with one or two other project managers. They have no trouble
with acquiring knowledge, because they do not compete. Still, most of the time, they have no idea which project manager to call for certain knowledge questions, because they don’t know what kind of knowledge the other has. Furthermore, they have trouble with acquiring knowledge from the PDR.

5.6) Results
There are two ways of presenting the scores on project-level (as discussed in the previous section) in order to produce results. I can count the number of projects that have addressed a condition properly or I indicate per project if it has an effective knowledge management system. I choose the first approach, because the information about other projects besides the case studies is limited and one-sided, which makes it difficult to estimate for each project the effectiveness of their knowledge management system.

An overview of the scores per project can be found in Appendix E. Some design principles on project-level were not asked to the project managers besides the ones of the case studies. Therefore, some of the scores on project-level are only based on the case studies. The final results of project-level are shown in table 3.

The scores on the design principles on project-level can be found in Appendix E as well. For some design principles it was possible to estimate the score per project, others design principles are just applied on programme-level or not. The results are shown in table 4.

<table>
<thead>
<tr>
<th>Design principles on project-level</th>
<th>Element</th>
<th>Score</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>The stakeholders of the ABG and KBG have face-to-face communication</td>
<td>People</td>
<td>100%</td>
<td>+</td>
</tr>
<tr>
<td>Stakeholders of the ABG and KBG are rewarded for knowledge sharing</td>
<td>People</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Project management has explicit knowledge management goals</td>
<td>People</td>
<td>50%</td>
<td>+/-</td>
</tr>
<tr>
<td>During meetings there is an open atmosphere of knowledge sharing</td>
<td>People</td>
<td>87.5%</td>
<td>+</td>
</tr>
<tr>
<td>The stakeholders know each other’s core values and interests</td>
<td>Process</td>
<td>100%</td>
<td>+</td>
</tr>
<tr>
<td>The stakeholders know the appropriate contacts of other stakeholders</td>
<td>Process</td>
<td>100%</td>
<td>+</td>
</tr>
<tr>
<td>The stakeholders encounter no problems finding knowledge at other stakeholders</td>
<td>Process</td>
<td>50%</td>
<td>+/-</td>
</tr>
<tr>
<td>The stakeholders have a common database</td>
<td>Technology</td>
<td>30%</td>
<td>-</td>
</tr>
<tr>
<td>The project has a public website</td>
<td>Technology</td>
<td>50%</td>
<td>+/-</td>
</tr>
</tbody>
</table>

Table 3: Results evaluation project-level
5.7) Conclusion Evaluation

This study started with the hypothesis that the project-structure in the programme Space for the River is new and that it is essential to share knowledge effectively in order to finish the programme before 2015 within budget and improved spatial quality. Although evidence that supports this hypothesis is limited, I have the feeling that many projectmanagers as well as local stakeholders (ABG and KBG) have difficulties with managing such a large infrastructure project. Many of the people that have been interviewed expressed the need to be able to access more knowledge easily. They want additional knowledge to improve the quality of their project or to improve their planning. The only real evidence is the list in Appendix F, which indicates the need for additional knowledge. However, much of the discontentedness is caused by the other factors that affect the success of the programme Space for the River (see figure 17), like the organizational structure of the PDR and the communication between ABG and KBG, and between PDR and projectmanagers. Therefore, knowledge is confused with information. For example, many projectmanagers expressed the need for a SNIP2A document of other projects in order to see what it should look like. This has nothing to do with knowledge management, but with bad communication between the PDR and the projectmanagers about the content of such a SNIP2A document.

Still, the hypothesis is not falsified and even supported a little bit. The real test for this hypothesis is to evaluate at the end of the programme if knowledge sharing has been essential for its success. This test falls outside the scope of this research, because it will take another 9 years in order to do this test. For now, the hypothesis is still applicable and justifies the research to the effectiveness of the current knowledge management system in the programme Space for the River.

An evaluation framework has been used to identify the design principles that should be addressed for a knowledge management system to be effective. This is done for the context on project- and programme-level. As stated in section 5.3.4, at this moment, the evaluation framework cannot be used to estimate the exact level of effectiveness. Instead, the conclusion will point out the strong

<table>
<thead>
<tr>
<th>Design principles on programme-level</th>
<th>Element</th>
<th>Score</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>The projectmanagers have face-to-face communication</td>
<td>People</td>
<td>100%</td>
<td>+</td>
</tr>
<tr>
<td>Best practices in one project are shared with other projectmanagers</td>
<td>People</td>
<td>No</td>
<td>-</td>
</tr>
<tr>
<td>Tasks are established to identify the information resources necessary for the organizations</td>
<td>People</td>
<td>Yes</td>
<td>+</td>
</tr>
<tr>
<td>The PDR informs of and rewards collaborators’ achievements</td>
<td>People</td>
<td>No</td>
<td>-</td>
</tr>
<tr>
<td>There are incentives to achieve the overall aims of the programme Space for the River</td>
<td>People</td>
<td>No</td>
<td>-</td>
</tr>
<tr>
<td>Projectmanagers have no difficulties of acquiring knowledge from other projectmanagers or PDR</td>
<td>People</td>
<td>40%</td>
<td>+/-</td>
</tr>
<tr>
<td>There is a system to codify explicit knowledge</td>
<td>Technology</td>
<td>No</td>
<td>-</td>
</tr>
<tr>
<td>Projectmanagers and PDR have a common database (extranet)</td>
<td>Technology</td>
<td>No</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 4: Results evaluation programme-level
and weak points. The weak points pinpoint those aspects that need improvement.

5.7.1) Conclusion project-level
The weak and strong points of the knowledge management system on project-level are divided in knowledge sharing between local governments (ABG), and between the ABG and the Sounding Board Group (KBG).

In the case studies, the stakeholders of the ABG indicated that the ability to share knowledge is properly addressed. Most of them know each other from previous projects, which created trust. Consequently, they know each other’s core values and interests. The meetings of the ABG have an open atmosphere and stakeholders have not encountered problems finding knowledge from other stakeholders. The lack of a database was not considered a big problem, because there were little documents to share. The relatively safe environment of the ABG (confidentiality is secured) stimulates the knowledge sharing between the members of the ABG. Besides the case studies, most projectmanagers of the other projects confirm these conclusions about the ABG.

In conclusion, most design principles for effective knowledge sharing within the ABG have been addressed properly. Therefore, the knowledge management system for the ABG is considered to be effective and doesn’t need many improvements.

The stakeholders of the KBG were not satisfied with the effectiveness of the knowledge management system. Although projectmanagers expressed the importance of public participation, they have not properly addressed the design principles of the knowledge management system that stimulate social learning. The research confirms the many weak points of the knowledge management system. The lack of a database made it difficult for stakeholders in the KBG to get access to documents on time; which is essential for a full-fledged participation in the decision-making process. The lack of explicit knowledge management goals has created unawareness of knowledge management. Most stakeholders in the KBG know the contacts and interests of stakeholders in the ABG, but these stakeholders are not willing to share knowledge all the time. This is the result of the fact that the KBG is not able to treat this information confidentially and leaks important information to the press. This is a common problem at social learning (Maurel et al., 2004; Mostert et al., 2007). Also, knowledge sharing is hampered by the fact that in some projects, the KBG is full of local stakeholders who have been actively involved in resistance against the project. These stakeholders are suspicious and behave strategically. It requires a lot of effort to establish an environment of trust in order to exchange knowledge.

In conclusion, knowledge management on project is not fully stimulating social learning. However, most problems with public participation in the decision-making process have to do with ineffective process management. The lack of clear process rules is, according to my opinion, a major problem in the ability to share knowledge between stakeholders of the ABG and KBG. This problem falls outside the scope of this research. Therefore, the design of an improved knowledge management system on project-level will not be done. However, I like to include the problem about public participation as a knowledge subject that can be shared among the project-teams within the programme Space for the River.

For solutions to improve public participation, I like to recommend the findings of the doctoral thesis of R. A.H. Monnikhof (2006). He developed 12 guidelines for successful public participation in spatial issues.
5.7.2) Conclusion programme-level

The PDR has two major tasks: to control and facilitate the initiators. The latter includes facilitating knowledge sharing as well. At the moment, the PDR have only addressed the design principle that organizations have face-to-face communication (i.e. project managers meeting day). Recently, the PDR established a knowledge-broker who tries to link information resources to organizations that demand knowledge. Furthermore, the necessary design principles for an effective knowledge management system have not been addressed properly. The technology element has not been addressed at all. The inability to be able to share knowledge effectively is felt by many project managers. During the interviews, I identified the different knowledge subjects that they like to receive or share (see Appendix F). This list is proof that there is a need to share knowledge. The conclusion that an improved knowledge management system is necessary is stipulated by the fact that some project managers, who did share knowledge, indicated that it improved the quality of decision-making and planning (see Appendix D: analysis evaluation).

In conclusion, on programme-level, knowledge management is not very effective and causes the Community of Practice to operate on a minimum basis. Therefore, on programme-level, I conclude that the programme Space for the River needs an improved knowledge management system that addresses all the design principles as identified for a lively Community of Practice.

5.7.3) Applicability evaluation framework

The initial purpose of the evaluation framework was to estimate the effectiveness of the current knowledge management system within the programme Space for the River. On project-level the system had to stimulate social learning and on programme-level a CoP. For this research, these types of context provided a good starting point to identify the design principles. But are the results of this evaluation applicable in other projects or organizations?

First of all, the evaluation framework in general provides a flowchart that can be used in any context. The results of this research, however, can only be used in any context that matches the context characteristics of the programme Space for the River. In other words, the results for project-level are applicable for any infrastructure projects with public participation. The new project-structure used in the programme Space for the River, however, has not been used before on such a scale. A CoP between public organizations in infrastructure projects is relatively new. Still, if new infrastructure projects will use the same project-structure, the results of this research could be very useful.

Secondly, the inability to estimate the exact level of effectiveness gave the evaluation framework a second purpose: identification of the strong and weak points. However, even the results of this identification rest on the assumptions that the right context has been selected as well as the right design principles. In what way do the characteristics of the context determine the type of context? Is the right context identified? Are all important design principles identified? Additional research is required to create an evaluation framework that is applicable to estimate knowledge management systems in different contexts.

Step 1: The evaluation framework must include a complete list of types of contexts with their adjoining characteristics. This makes it possible to select the right type of context when a researcher has identified the ‘scores’ on the different characteristics. More research, using experts and additional literature, should make it possible to create such a list as well as to identify additional characteristics.

Step 2: The next step is to identify the appropriate design principles for each possible type of
context. Again, more research, using experts and additional literature, should be sufficient to identify these design principles.

Step 3: A last research subject is to indicate how the scores on the design principles relate to the level of effectiveness. From a theoretical and empirical point of view, it has been impossible to identify all the right design principles based on hard evidence that should result in maximum effectiveness of knowledge management. It has everything to do with the fact that little has been written about knowledge management within a public setting. The only way to measure this is by implementing different sets of design principles and seeing what the consequences are on the success of the programme. This requires multiple projects like the programme Space for the River. In addition, to indicate the relationship of design principles and the level of effectiveness in other types of context, even more experiments are required. This is a lot of research and even then the number of experiments will be limited due to the long lead time of projects and the limited projects available to experiment with.

A first step to provide some support for the findings of this research (the context characteristics, the types of context and the design principles) is to improve the identified weak points on programme-level and evaluate the outcomes. The second part of this Thesis will deal with the design of an improved knowledge management system on programme-level. The design principles as in Table 4 should act as a starting point.
6) Knowledge management system

6.1) Introduction
In the first part of the thesis, the conclusion of the evaluation indicates that an improved knowledge management system is required in order to finish the programme Space for the River before 2015 within the conditions set in the SPKD. Knowledge sharing on programme-level is seen as a Community of Practice (CoP). Therefore, the knowledge management system must facilitate this CoP. The goal of the second part of the thesis is to design an improved knowledge management system by using the design principles as identified in section 5.3.2.

Section 6.2 will describe the design-method that is used to design the system in a structured way. Section 6.3 reveals the requirements and the constraints that must be taken into account. Section 6.4 will discuss the technical part of the system. Section 6.5 focuses on the institutional part, while section 6.6 discusses the implementation process of the system.

6.2) Design method
The design method is inspired by the Meta-model (Herder, 2006). This model is used to design in an environment with many stakeholders, which makes it appropriate in the context of this study. The model starts by identifying the requirements and constraints of the users of the system and uses this to select the solutions that are most optimal within the solution space. The solution space is determined by the constraints and includes all possible solutions that satisfy the minimum or maximum value of these constraints.

My design method starts with the identification of requirements and constraints of the users (i.e. the members of the different public organizations). Requirements are elements that the knowledge management system should have and constraints are elements that it must have. All requirements and constraints together are the Basis of Design (BoD). The requirements and constraints are identified by means of interviews, the same interviews as the evaluation. The second step is to design a concept design. The BoD and the design principles, as identified during the evaluation, provide the building blocks of the design. The design of the knowledge management system is divided into three parts. The system has a technical design, an institutional design and a process design. The technical design includes the instruments/ICT-systems that are needed to exchange knowledge. The institutional design includes the set of responsibilities, task and agreements. The process design includes the implementation steps towards a fully operating knowledge management system.
management system. The different designs are interdependent, because decisions in one design will influence the possibilities for another design (see figure 22). For example, the choice for an extranet (technical design) will imply that somebody becomes the moderator (institutional design). The third step is to test the concept design if it satisfies the need of the users. In other words, do the users see no obstacles in the ability to share knowledge properly? The last step is to use the test result to design the final improved knowledge management system. This sequence of design steps is shown in figure 21.

![Figure 22: Design Dependency](image)

The testing of my hypothesis is not included in this research. However, I like to indicate the steps that should be taken to see if the hypothesis is true. As shown in figure 21, the next step after the final design is its implementation. The implementation-steps are included in the process design. After a while, when the system is operational, the users should be consulted again. This evaluation will indicate if the improved knowledge management system works more effective. In addition, the results of this evaluation could provide some support for my new approach to measuring the effectiveness of a knowledge management system.

6.3) User participation
The design incorporates the requirements and constraints of the users of the knowledge management system by starting with the Basis of Design. Furthermore, I decided to present the draft design to the users as a last check. End-user involvement in the design and implementation of the system is crucial for designing an effective extranet (Carrillo et al., 2000). By participation of the users in designing of the knowledge management system, the chance for success of the system is increased. Users feel a sense of ownership and are more likely to use the system to share knowledge.

6.3.1) Basis of design
The Basis of Design includes all the requirements and constraints from the projectmanagers (10 in total) that have been interviewed. The results from the interviews have been summarized and sent by e-mail to all projectmanagers for verification. Four projectmanagers have given feedback by e-mail. Their comments have resulted in a BoD that is split up in institutional, technical and process requirements and constraints (see Appendix G). It is important that the knowledge management system complies with the BoD in order to get enough support from its users, which is essential for the implementation.
6.3.2) Feed-back projectmanagers

With the BoD and the findings in the literature, I designed a draft knowledge management system. Instead of a focus group (no time available at the projectmanagers meeting day), I have discussed the draft design with three projectmanagers. They were all pleased with the design and were looking forward to use it. However, they suggested some improvements, which are included in the final design. Therefore, the final design is based on the BoD, scientific literature, interviews with knowledge managers, feedback from some projectmanagers, and my opinion as objective observer.

6.4) Technical design

The technical design is concerned with the mechanisms that can help connect people with information, and people with each other. It is the technical element of the knowledge management system. Already, in the first part of the thesis it is stipulated that without a good IT support system it becomes almost impossible to share knowledge. Communities of Practice should classify and organize all documents that are shared in order to establish a common mechanism for structuring and storing the collective memory of their members (Lesser & Storck, 2001). Another technique that facilitates CoP is a technology that makes it easier to find and contact fellow community members (Lesser & Storck, 2001). These functionalities are underlined in the BoD.

The most suitable IT support system is an Extranet. An Extranet is a private network that uses the Internet to securely share information or operations with selected partners; it is accessible from any web browser (Valaitis et al., 2005). However, web-collaboration tools currently on the market can create hundreds of extranets, each for specific clients, matter, project or event (Daniel & von Elling, 2004). This section will discuss the functions that the extranet for Space for the River needs. Most functions are derived directly from the BoD.

Another important aspect for a CoP is building of trust and commitment among the members of the community (Lesser & Prusak, 1999; Lesser & Storck, 2001). A simple technique is realizing face-to-face communication (Cong & Pandya, 2003). This aspect is covered by the Projectmanagers meeting day, which is four times a year. During such a day, projectmanagers, members of a project-team and people from the PDR exchange knowledge by having discussions and presentations. Although it is not an IT system, I consider it a technique. In this section, I will also discuss the possible improvements of a projectmanagers meeting day as part of designing a knowledge management system.

6.4.1) Designing an extranet

The selection of the functionalities does not include a test, because it is very difficult to estimate the quality or quantity of each function in comparison to the BoD. The selected functionalities come directly from the BoD or are based on my opinion.

Common database

The most important function of the extranet is the ability to store (large) documents that can be downloaded by all users. These documents include the explicit knowledge that can help others, which must come from other users. Users can post documents unlimited, although people from the PDR have to submit documents to the moderator of the extranet, which will upload it on the extranet (the tasks of the moderator is discussed at the institutional design). Each document must have a summary of 2 or 3 sentences, which makes it possible for the users to quickly see what the content of a document is. The users must also indicate if the document is a concept version, a final version or replaces another document.

Important is that the content of the database must remain fresh and relevant to the users (Lesser
A content manager could do this, but this will be discussed in the institutional design.

**Search engine**

An extranet must be user-friendly. The main task of the extranet is finding the knowledge that the user seeks. Therefore, the user-friendliness is determined by the speed with which a user finds the knowledge he seeks. The BoD states that documents should be divided in knowledge-subjects and project-phase. Additionally, a map should point out all projects and by clicking on a project, all documents concerning that project can be found. General information or pictures of the project area can be found on the public websites of the individual project (there should be a link to this public website). In total, the extranet should have four different portals to find the appropriate document quickly:

1. By clicking on the right knowledge-subject
2. By clicking on the right project-phase
3. By clicking on the right project on the map
4. By using a general search engine

Figure 23 shows a possible configuration of the search portals on the extranet. The different knowledge subjects are inspired by the content of Appendix F and the feedback of the project managers. The interactive map comes from the website of Space for the River (www.ruimtevoorderivier.nl). The general search tool will act as a Google-search machine. It will scan the name and the content of the documents for tags.

The four portals to come to the right document imply that each document comes with information about the knowledge-subject, project-phase and project. In addition, each document should have a summary as indicated in the BoD. Figure 24 shows a possible configuration of uploading a document. Each field must be addressed; otherwise the document will not be uploaded. The user must also indicate if the document replaces another document (when it is a newer version).

**Rogues gallery**

The second important function of the extranet is to find the contact information of other users quickly. According to Lesser & Storck (2001), reusing a document without knowledge of the situational context in which it was developed is difficult. Therefore, the ability to contact the developer is very important. Whereas the document provides explicit knowledge, direct communication can be used to transfer tacit knowledge. In other words, the users are a knowledge source themselves. Therefore, the success of the knowledge management system is not determined only
by sharing documents, users should communicate as well to extract additional tacit knowledge. Communication can go by phone, email or face-to-face.

Each user has a profile that includes the name, contact information, project, function, organization and photo. This profile must be up-to-date at all times. If somebody is replaced, this new person should keep the account and must only change the profile. In addition, each user must be able to change his or her username and password. Figure 24 shows the possible configuration of somebody’s profile. Furthermore, to make sure that a user can always contact a person about a document, it is preferred that each project has multiple contacts and not only the project manager.

![Figure 24: Different functions of the extranet](image)

**Forum**
In case of not finding the right document or person, a user can post a knowledge question (see figure 24). This question can be seen by all users on the homepage and is sent to all users by email (electronic newsletter). If somebody can help, he or she should mail or call the person that has posted the question. If a knowledge question is answered properly, the knowledge question should disappear and the user that had the question must indicate who has helped him. This is part of the reward-system, which will be discussed at the institutional design. Also, when a knowledge question is still not answered after a couple of weeks, the moderator should delete the question.

The forum is not for having a discussion group online, because I assume that the users will not use the extranet every day. For a discussion to keep going, users should post comments regularly, otherwise users stop looking. The frequency of visits will probably be too low. However, it is possible to add this function if users show a desire to chat by means of a discussion-group. This will be discussed at the process design.

**Message board**
In order to create a collective feeling of working together in the programme Space for the River, it is helpful if members of the different public organizations know what is happening at other projects. Users can post messages about important decisions or events (see figure 24). The moderator must approve the messages in order to prevent misuse. For example, the BoD states that users should not publish judgements about (bad) experiences with private companies. It also states that there should be an obvious distinction between facts and opinions. The moderator can filter the messages and make sure that the requirements in the BoD are satisfied.

**Electronic newsletter**
Each week the new messages, knowledge questions and documents will be included in an
electronic newsletter. This newsletter should include direct links to the new documents on the extranet and the contact-information of persons who have posted a knowledge question. The moderator can add extra news, but this should be published at the bottom of the newsletter, because the new documents and knowledge questions are more important (see figure 25). The electronic newsletter is sent to all users and other people who are interested. These people can only subscribe with permission of the moderator. The newsletter should be composed and sent automatically every week. This will reduce the moderator’s tasks. If there are no new messages, documents or knowledge questions there should be no newsletter. When needed the frequency of the newsletter should decrease to every two weeks or even less.

A possible configuration of the homepage can be found in Appendix H.

6.4.2) Improvements projectmanagers meeting day
The projectmanagers meeting day is organized four times a year by the PDR. It is an important part of the knowledge management system, because projectmanagers get to know each other and knowledge is exchanged. I attended two of these meeting (21-6 and 11-9), the first was at Ford Vechten between Utrecht and Bunnik and the second was in the city centre of Utrecht, the Polmanshuis. My observations together with the interviews with the projectmanagers are the bases of my recommendations.

Location
Although Fort Vechten was an inspiring location, it was not easily accessible, especially not with public transportation. A location should be central and easily accessible, like the second location in Utrecht. On the other hand, a nice location increases the change to network. One projectmanager suggested visiting a different location each projectmanagers meeting day. This day should include a kind of tour in the project area together with comments of the projectmanager. This creates more time for small talk (networking) and a nice feeling contributes to the feeling of trust. My suggestion is to organize the projectmanagers meeting day twice a year at a central location when the Progress reports need to be discussed (like the Polmanshuis) and twice at a project-location. The days at the project-locations should be organized in cooperation with the projectmanager.
Agenda

The presentations were done plenary and in carrousels. Especially, the carrousels were effective. It included small groups that chose to go, because they were interested in the subject of the carrousel. This resulted in much more discussion in comparison to plenary presentation that some people find not interesting. The discussion improved without PowerPoint, because it encouraged people to participate more actively. Therefore, PowerPoint presentations as well as plenary presentations should be kept at a minimum. It’s better to have a carrousel with two subjects than two plenary presentations. Furthermore, try to focus on specific problems during the presentation instead of general stories that are not new for most participants. If participants don’t learn anything, the will to come to the next meeting decreases.

To increase the trust among the projects, there should be more time for small talk at the coffee table. During the meetings, participants could talk when they arrived, during the lunch and afterwards. However, most participants went home as soon as the last presentation was over, because they had to travel back home. If the meetings were not that long (from 9 am up till 16:30 pm) participants will probably stay longer afterwards. Also, there should be a room for people that don’t want to participate in a carrousel and just want to network.

Participants

During the projectmanagers meeting day in Ford Vechten, there were many people of the PDR as well as presentations by people of the PDR. This resulted in much discussion between PDR and projectmanagers about lack of clarity instead of knowledge sharing. During the second meeting, presentations were mainly done by projectmanagers, which increased the knowledge sharing. Therefore, presentations should primarily be done by projectmanagers or other project teammembers. The people of the PDR that attend the meeting should be limited to those that can contribute to the discussion or provide some additional information about subjects that need extra clarification.

Often, the same projects that are far ahead give presentations, but I think that if a project that has just started gives a presentation, it will result in discussion as well. This balances the effort of preparing a presentation. Also, the projectmanagers must decide what will be the content of the presentations. The content of the meeting should be on demand. Furthermore, projectmanagers should ask the following question all the time: “We do it like this, but how are you doing it?” It should not always be the projectmanager that gives a presentation. Other team members can help as well, which gives projectmanagers the chance to talk to another projectmanager in a different room.

6.5) Institutional design

The institutional design deals with the set of responsibilities, task and agreements. It includes the people and process elements of a knowledge management system. The BoD provides a list of issues that must be addressed. The issues are discussed and a selection of solutions (i.e. knowledge management measures) will be mostly based on scientific literature or argumentation on my part.

6.5.1) Who are the users of the extranet?

Next to the projectmanagers meeting day, the extranet is to increase knowledge sharing between the public organizations of the programme Space for the River. The BoD states that the system must be for Space for the River people only. This can be people from the PDR, a projectmanager or even a member of a KBG. A first selection can be made by using the constraint that information must be treated confidential. Members of the KBG have trouble keeping information confidential. Sometimes, they use publicity in order to influence the decision-making process (See interview
with Adri Wever in Appendix C). A second selection criterion is that the members of a CoP must be able to add knowledge (Wenger, 1998). I don’t think that members of the Steering Group or ABG can add a lot of knowledge, because often the programme Space for the River is not their priority. I assume that they will not be active on the extranet and by allowing them to become a user, the chance is increased that information is not treated confidential.

That leaves the members of a project-team and people from the PDR as potential users. The BoD states that the system should be for projectmanagers only. This is conform the strategy of the PDR by giving the initiators (i.e. regional and local governments) more autonomy in managing their projects. The extranet can help them to exchange knowledge easier and makes them less dependent on the PDR. However, not using the knowledge at the PDR is a waste of resources. Therefore, primary users of the knowledge management system are the members of the different project-teams. The people of the PDR are secondary users, which implies that they can only post documents and react on knowledge questions that are posted by the primary users of the extranet. In total, approximately 130 people will use the extranet.

6.5.2) How are users stimulated to share knowledge on the extranet?

This is the most important success factor of the knowledge management system. The scientific literature, as indicated in chapter 4, provides several measures:

- Participation of users in the co-design of an IC-Tool (Maurel et al, 2004)
- A recognition or reward system (Wah et al., 2005)
- Full management support (Riege, 2007)
- Proving the appropriate resources (Wenger, 1998)
- Build an environment of trust (Wah et al., 2005; Lesser & Prusak, 1999)
- Raise awareness of benefits of knowledge sharing (Liebowitz, 2005; Chourides et al., 2003; Cong & Pandya, 2003)

**Participation of users in the co-design of an IC-Tool**

By involving the users in the design process, they feel a sense of ownership that leads to trust the tool. This should stimulate users to use the extranet. This aspect has been included from the beginning. The BoD and the feedback on the initial design cover the participation of the user.

**A recognition or reward system**

Being active on the extranet requires time and if the users do not see what is in it for them, they will stop using it. The success of the extranet is determined by the effort of the projects that have made the most progress (i.e. the ‘koplopers’). These projects have encountered and resolved many problems. They have a lot of knowledge that is very valuable for projects that have just started. In general, these projects can give more than they will ever receive. Still, the ‘koplopers’ can learn from each other, but this requires that they post new documents quickly (preferably within a week). The projectmanagers are more stimulated to share knowledge if they receive recognition or a reward.

One way to recognize the contribution of a user is to record all the documents and messages that he or she has posted. Also, it is recorded when somebody helps another user by answering a knowledge question on the forum. The users that have posted most documents, messages or answered knowledge questions will be mentioned in the electronic newsletter and acknowledged for his or her contribution. Additionally, these records can be used to give the most active users a present during the projectmanagers meeting day (like a sauna-coupon), or an award that changes hands all the time. This should have a high level of entertainment.
Another way to recognize a user for its contribution is by publishing success stories. The moderator can add stories in the electronic newsletter about the positive results of knowledge sharing. If users read that their contribution have resulted in an improvement in another project, they become more motivated to share knowledge (Cong & Pandya, 2003). Success stories could also be told during the projectmanagers meeting day.

A third way to recognize the contribution of a user is by making it obligatory to publish the source in the references when using knowledge of another user (see BoD). However, this seems difficult to control and may be a threshold to use that knowledge. Therefore, management should not make it obligatory but has to point out that it is preferred.

**Full management support**

The support of the Direction team (DT) of the PDR for the extranet is essential to advertise the importance of knowledge sharing, because a Community needs leadership in the form of a networker (Wenger, 1998). Especially the Riviertakmanagers should keep stimulating projectmanagers to use the extranet by bringing up its importance during meetings. This should be done carefully, because of the dilemma concerning the management of a CoP. Although communities are self-organizing and resistant to supervision and interference, they sometimes need specific managerial attention (Wenger & Snyder, 2000). Especially inter-organizational community requires more managerial input (Soekijad et al, 2004).

Furthermore, the DT should decide about additional resources for projects to be able to use the extranet, like more money. Also, DT-members should encourage their subordinates to answer knowledge questions on the forum and to post important documents. The DT-members could state that it is part of their job description and discuss this during personal annual job evaluations.

**Proving the appropriate resources**

The BoD states that users of the extranet don’t want to be called daily by another user asking for knowledge. Most projectmanagers are busy and don’t have much time to help others. However, at first, all stipulated the importance of the extranet and the projectmanagers meeting day and are willing to help others. Still, sharing knowledge is more encouraged by providing the financial needs of users (more fte) such as additional employees for the project-team, travel-expenses when projectmanagers want to meet each other to exchange knowledge, meeting facilities where projectmanagers can have meetings (Wenger, 1998). It is also important that new users are educated on how to work with the extranet (Wiig, 2002). This makes sure that newcomers can become full members of the Community, because it helps to ensure access for newcomers without diluting the community’s focus (Wenger, 1998).

**Build an environment of trust**

Individuals are more likely to share knowledge with another whom they feel comfortable with or if they have similar personal interests. Therefore, it is important to facilitate this social interaction by organizing face-to-face communication (Wah et al., 2005). This is done during the projectmanagers meeting days. Without face-to-face encounters CoP become less effective (Lesser & Prusak, 1999).

Also, the confidentiality of the knowledge is taken care off, which should stimulate an environment of trust. By using the extranet, members can ‘test’ the trustworthiness and commitment of other community members. Members who help other members expect the same vice versa. Lesser & Prusak (1999) call it the ‘currency’ of the community. Helping members should result in credits and can be changed for knowledge from another user.
Raise awareness of benefits of knowledge sharing

This measure is covered by the fact that Riviertak-managers should keep asking projectmanagers to use the extranet and by publishing success-stories in the electronic newsletter and during the projectmanagers meeting days.

6.5.3) Who should be the moderator of the extranet and what are his/her task?

Managing the extranet is the task of the PDR. The role of moderator who takes care of the day-to-day work is crucial (Wenger, 1998). The different tasks that have to be done and the number of hours per week are seen in Table 5: tasks moderator. In total, the moderator requires +/- 4 hours a week in order to manage the extranet properly. Therefore, it is not needed to hire an additional employee. It must become a task of somebody already working at the PDR. Concerning the subject (knowledge), it seems straightforward that somebody at the Knowledge Management Unit becomes moderator. Important is that this person answers to a DT-member, who is responsible in the end for the extranet. This way, the DT can control the moderator, who acts like a kind of filter.

<table>
<thead>
<tr>
<th>Tasks for the moderator of the extranet</th>
<th>Estimated hours/week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter new messages</td>
<td>1</td>
</tr>
<tr>
<td>Record new users and provide them with a username and password</td>
<td>0.5</td>
</tr>
<tr>
<td>Approve documents and messages send by people from the PDR</td>
<td>1</td>
</tr>
<tr>
<td>Write success-stories for the electronic newspaper (doesn’t have to be every week)</td>
<td>1</td>
</tr>
<tr>
<td>Keeps track of the contributions of the different users to be able to indicate who receives a reward during the projectmanagers meeting day</td>
<td>0.25</td>
</tr>
<tr>
<td>Delete irrelevant documents and old knowledge questions</td>
<td>0.25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4.00</strong></td>
</tr>
</tbody>
</table>

Table 5: tasks moderator

6.5.4) What are the rules of the system that a user must comply with?

The success of the system is that users are willing to share knowledge. This implies that users can take knowledge, but also have to give knowledge. Without any rules, it is likely that users will only take. This can be considered a kind of strategic behaviour. Section 3.4 indicates the characteristics of a network: different organizations, mutual dependency, core values and dynamics. This knowledge system included different organizations, which are mutually dependent in order to share knowledge. The system is dynamic, because its content, users and maybe functions will change over time. Therefore, the extranet is a network that needs process rules to make sure that strategic behaviour doesn’t limit the success of the extranet. Therefore, users of the knowledge management system should address the following rules:

- Each project must be represented during the projectmanagers meeting day. Preferable by the projectmanagers, but otherwise a member of his/her project team. Face-to-face communication is essential for building trust and hence for the success of knowledge sharing.
• Each project must prepare and lead a discussion about the subject of their choice approximately once a year during the project managers meeting day. There are approximately 16 discussions available each year (4 meetings x 2 carrousels of 2 discussions = 16). It prevents that the projects with the most progress have to lead the discussions all the time. I think that a project that has just started is capable of leading a discussion just by presenting his/her strategy and asking for comments. This will start a discussion and often others are willing to share their experiences if they see that they are helping. However, the number of projects that have started will increase, which means that it is not always possible for every project to lead a discussion each year.

• The project manager is responsible for stimulating the use of the extranet within his project team. Some members need extra attention to be stimulated to use the extranet (Wenger, 1998). He/she must make sure that all profiles are up-to-date and that important documents are uploaded. He/she must confirm a new user of the extranet from his project by sending the moderator an e-mail. This prevents misuse of the extranet.

• If somebody calls another user for knowledge (for example more explanation based on a document), this user must help the other user. If he/she is busy at that moment, he/she must call back the same day (if possible) in order to help the other user. If users are not helped sufficiently and quickly, they lose faith in the system and will try to find knowledge elsewhere. Users should ask the question: “How do I like to be treated when I call somebody for help?”

• Users of the extranet that have posted a knowledge question must indicate who have helped them. First of all, it makes sure that the question is removed from the forum and secondly, it is possible to indicate who shares a lot of knowledge and who doesn’t. Furthermore, it should help others if the person that had the question provides a short summary of the answer that he/she received. This makes it possible for others to locate that knowledge again.

• The user that knows most about a document should upload the document, which ensures that other users call the right person when they want additional knowledge about that document.

6.5.5) Risks
The introduction of a knowledge management system is not without any risks. Due to the complexity of the system, it is always possible that certain aspects don’t work like they are supposed to. This section will discuss the possible risks, their consequences and how contingencies can be incorporated in the system. The risks are:

1. The critical mass level is not attained quickly
2. Users have other priorities
3. The system needs to be adjusted
4. Users don’t give but only take knowledge
5. Knowledge is not used confidentially

1) The critical mass level is not attained quickly
For the success of the system it is essential that new users are to be convinced about the surplus of knowledge sharing. An important aspect is that the user, who uses the extranet for the first time, finds the knowledge he/she requires. If the user cannot find what he/she is looking for after a second or third attempt, the user is likely to lose faith in the system. If this happens with many new users, the group of active users will not grow and eventually disappear. In conclusion, the extranet will not be used anymore and the investment of +/-15.000 euro is lost. Therefore, it is of utmost importance that the system goes operational if everything works. In addition, the PDR
must stimulate the new users to add new documents and call each other. And if the critical mass is not attained, the PDR should evaluate what went wrong and adjust the knowledge management system (incl. technical and institutional aspects) if this is required.

2) Users have other priorities
Due to deadlines or understaffing it is possible that users don’t have time or will to participate in knowledge sharing with other users of the knowledge management system. The result of too few users is explained at the first risk: “the critical mass level is not attained quickly”. This phenomenon is often the cause of ineffective knowledge management systems (Riege, 2007). The project managers stipulated that there should be no form of obligation to use the system. However, if users are not using the system because they have other priorities, it is maybe a solution to make some aspects of the system obligatory for the users or force them to hire more staff.

3) The system needs to be adjusted
An adjustment in the system must be taken care of by an Internet-company, which means extra costs. The faith of upper management (the DT) in the system will determine if these extra costs are justified. If the costs are too high and the system is not adjusted, it could mean that users are hampered in sharing knowledge and stop using the system. In short, if an evaluation of the new system indicates that an adjustment is required and there is no adequate funding, the users could stop using the system. Knowledge is not shared effectively and the success of the programme Space for the River becomes questionable (see hypothesis). On the other hand, if an adjustment is approved, the process of adjusting the system could imply that the system is temporarily off-line. This should be kept to a minimum.

4) Users don’t give but only take knowledge
Despite the measures described in this chapter about stimulating knowledge sharing, it is possible that some users (if not all) only take knowledge. These users will only use the extranet when they need knowledge, but will not post documents or help others when they call for knowledge. The risk is that, if nothing is done to tackle this problem, the active users start reflecting their effort with those who only take knowledge. Active users could become dissatisfied about the attitude of users who only take knowledge and become inactive themselves. The group that can only take knowledge is considerable. At the moment, there are more projects that are starting (need knowledge) in comparison to projects that are far ahead (possess knowledge). To control this risk, it is essential that the moderator keeps track of the activity of each user. If a user is inactive, the moderator should contact him/her and try to motivate him/her to also give knowledge.

5) Knowledge is not used confidentially
If users notice that their knowledge (or information) is not treated confidentially, they will be reluctant to share certain knowledge. This could hamper knowledge sharing in such a way that the amount of knowledge is too limited and users stop using the system. Again, knowledge is not shared effectively and the success of the programme Space for the River becomes questionable (see hypothesis). Therefore, the moderator must intervene immediately when a user hasn’t treated knowledge confidentially by warning this user for the consequences of his/her actions.

6.6) Process design
The last part of the design is concerned with the implementation steps. It takes effort to set up an extranet. It is essential that the implementation go well, because the success of the extranet is to get a critical mass quickly. If users don’t find what they are looking for after two or three times, they probably will lose faith in the system and will stop using it.
Step 1: Get full support of management
The members of the DT must be convinced of the benefits of the extranet and provide the resources
to design and implement it. Furthermore, they have to stimulate potential users to cooperate and use the system.

**Step 2: Design Extranet in cooperation with the users**
The design of the extranet with its functionalities and appearances must be done in cooperation with its potential users. By integrating their preferences its more likely they will use the system. This step is partly covered by the fact that I use the BoD to design the technical and institutional part of the extranet. Still, during the design phase, there should be consultation with potential users periodically. (The extranet is designed by an ICT-firm and the extranet will be ready in November 2007.)

**Step 3: Indicate the moderator and responsible DT-member**
The task as moderator will be almost full-time during the implementation of the extranet. When everything is up and running it will take approximately 4 hours a week (see section 6.4.3). The DT-member that becomes responsible should stimulate other DT-members and people of the PDR to cooperate. He/she will have more power to make sure that projectmanagers and people of the PDR use the extranet.

**Step 4: Start pilot**
Before the extranet is opened to all users, it can be helpful to start with one or two users. Educate them and ensure that they place all their relevant documents. Any possible flaws in the system can be repaired or certain adjustments can be made before going full scale.

**Step 5: Provide projectmanagers and people at the PDR with username and password**
When the extranet is ready, it is time to distribute the usernames and passwords to all projectmanagers and people at the PDR. This should be done during the projectmanagers meeting day, a kind of kick-off meeting (Lesser & Storck, 2001). Users that are not present should receive a mail, which should look professional. During this projectmanagers meeting day, there should be a carrousel about how to use the extranet. In addition, all users receive a manual that includes the rules and explanations of the different functions. Also, during this day, it is efficient to bring a camera to make pictures for the profiles.

**Step 6: Fill the Extranet with documents**
This is an important step, because it is essential that there is critical mass quickly (Wenger, 1998). This implies that all users must upload all relevant documents quickly. Again, it is important that the person that knows most about a document uploads that document. It seems more logic that the PDR posts all relevant documents they have. It is essential that many documents be uploaded, because after a couple of times when users use the extranet, they have to see the benefits of the extranet immediately. In the beginning, it is the task of the moderator to stimulate users to upload documents. After a while, it should become the task of the riviertakmanagers.

**Step 7: Evaluate the extranet and projectmanagers meeting day together with the users periodically**
In order to get feedback and check if the knowledge management system works effectively, the PDR should consult the users periodically. This could be done by means of a questionnaire or an informal discussion during a projectmanagers meeting day. The questionnaire could be done online on the extranet.

**Step 8: Discuss the results in the Direction Team (DT)**
The DT should discuss the results of the evaluation together with the statistics generated by the
extranet. This way, they will keep in touch with the system and are stimulated to keep supporting the system by providing additional resources or encouraging projectmanagers to use the extranet more.

**Step 9: Make adjustments to the extranet or projectmanagers meeting day when needed**
The BoD states that the Extranet should start simple, which implies that only the necessary functionalities should be used. However, if the results of the evaluation indicate that users want additional functionalities, it must be possible to add them to the extranet. Support of the DT is essential to accomplish this. Examples of extra functionalities are:

- Discussion groups: users can start a discussion on the extranet and others react with messages
- Chat-function: users who are online can chat with each other directly
- Secured databases: a restricted database for a group of users. Other users of the extranet cannot download these documents.

### 6.7) Conclusion design

The final design includes a technical, institutional and process design. All these designs should make sure that the conditions for a knowledge management system in a CoP are present. This section includes a final check to see if all design principles, as set in section 5.3.2, are addressed properly. The scores are shown in Table 6.

**The projectmanagers have face-to-face communication**
Recommendations for the projectmanagers meeting day are focused on gaining more trust among users. There should be more discussion and time for coffee.

**Best practices in one project are shared with other projectmanagers**
The extranet gives more access to knowledge of other projects. Users can individually estimate, which of these projects is the best practice. Also, on the projectmanagers meeting day, the discussions will bring forth a best practice. However, the PDR does not explicitly indicate a best practice, but it could be an additional function on the extranet.

**Tasks are established to identify the information resources necessary for the organizations**
The knowledge subjects indicate the information resources that the users require. Also, the possibility of asking a knowledge question identifies what users want.

**The PDR informs of and rewards collaborators’ achievements**
The reward system includes the recognition during each projectmanagers meeting day of the user who has contributed the most to the CoP that period. It also includes a small prize, but this should not be taken too seriously.

**There are incentives to achieve the overall aims of the programme Space for the River**
Often, during projectmanagers meeting days, the Programme Director stipulates in his speech the importance of working together in order to be ready before 2015. However, there are no real incentives for the programme to finish successfully. I have not been able to figure out how to address this design principle in the final design.

**There is a system to codify explicit knowledge**
Each document that is uploaded onto the extranet includes information about the knowledge subject, project phase, project and status (concept or final). This way, the documents are codified and the extranet will become a kind of archive.
Projectmanagers and PDR have a common database (extranet)
The extranet is the most important aspect in the technology design.

Projectmanagers have no difficulties of acquiring knowledge from other projectmanagers or PDR
The rules that should be taken into account indicate that users should help other users by making contact via phone or e-mail. It is preferable that this is done the same day a question is asked.

In conclusion, all design principles are more or less addressed in the final design except one: There are incentives to achieve the overall aims of the programme Space for the River. It indicates the effectiveness of this improved knowledge management system. In addition, the user participation has increased the success of the system. Unfortunately, the implementation and evaluation of the improved system is not included in this research. It would be nice to be able to see if the new evaluation framework and list of design principles have contributed to design an effective knowledge management systems that partly determines the success of the programme Space for the River.

<table>
<thead>
<tr>
<th>Design principles on programme-level</th>
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<tbody>
<tr>
<td>The projectmanagers have face-to-face communication</td>
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</tr>
<tr>
<td>Best practices in one project are shared with other projectmanagers</td>
<td>✓</td>
</tr>
<tr>
<td>Tasks are established to identify the information resources necessary for the organizations</td>
<td>✓</td>
</tr>
<tr>
<td>The PDR informs of and reward collaborators’ achievements</td>
<td>✓</td>
</tr>
<tr>
<td>There are incentives to achieve the overall aims of the programme Space for the River</td>
<td>-</td>
</tr>
<tr>
<td>There is a system to codify explicit knowledge</td>
<td>✓</td>
</tr>
<tr>
<td>Projectmanagers and PDR have a common database (extranet)</td>
<td>✓</td>
</tr>
<tr>
<td>Projectmanagers have no difficulties of acquiring knowledge from other projectmanagers or PDR</td>
<td>✓</td>
</tr>
</tbody>
</table>

Table 6: Result final check
7) Reflection on my research

At the start of my thesis, the initial subject focussed on public participation and the level of effort that is required to do this in a satisfying matter. After a while, the new project structure of the programme Space for the River became more and more interesting. After two weeks the subject had changed into knowledge management, because I was curious if all organizations were able to cope with this new project structure. However, the subject knowledge management was unknown to me, which resulted in a long literature study.

The most difficult issue was to find a framework to estimate the effectiveness of a knowledge management system. It became clear to me, that such a system did not exists and that information about knowledge management for public organizations in an inter-organizational setting was limited. The goal to estimate the effectiveness of the current knowledge management system became a long process of trial and error, which started as a justification to design a (improved) knowledge management system. The solution to estimate the effectiveness to use design principles was an important ‘breakthrough’ during this research. The literature provided enough basis for a good identification of the appropriate design principles. However, the selection criteria for the design principles were missing. The solution was to identify the design principles starting with a type of context. This context was social learning on project-level and a CoP on programme-level. But this introduced a new problem. How is the type of context determined? Especially this problem is addressed improperly according to my opinion. Using the findings in the literature and some common sense, I could identify some characteristics, but I think that more research is required here. This will improve the usability of the new evaluation framework in other contexts. Also, the identification of the design principles and their abstraction level need more crystallization. In this research, the design principles have a high abstraction level, which have been made practical during the design phase of this thesis. In conclusion, as indicated in chapter 5.7.3, more research is required to clarify the identification of the type of context and design principles and to increase the applicability of my evaluation framework in other contexts.

Despite the fact that the evaluation framework was just based on assumptions, literature and interviews and not actual tests, it proved to be useful to indicate what aspects of a knowledge management system in the programme Space for the River were not addressed properly and needed improvement. The design of the extranet has been done in close cooperation with the users of the system. The design has been verified with projectmanagers and people from the PDR. The interviews and discussions with the projectmanagers provided, according to my opinion, valuable information. The projectmanagers were interested and more than willing to cooperate. Therefore, I have the feeling that the knowledge management system will be a success. It all depends on the people at the PDR who become responsible for the implementation. They should not deviate much from the design as presented in this thesis and should invest sufficient effort in stimulating the users of the system to place documents and call each other.

Furthermore, it is possible that this report suggests that the programme Space for the River is not going well at all and that my knowledge management system will fix everything. This is not my intention, because I think that, in general and considering the innovative approach, the programme Space for the River can be seen as an example how large infrastructure projects should be managed. The decentralization of the design phase is difficult for the people at the DGR and this is understandable. For many years, they could participate in the decision-making and focus on the content of the design. Now, they must refrain from all this and can only audit the plans of the initiators. Another issue that has caused some problems was the fact that some projects (‘koplopers’) had started before the foundation of the PDR. Consequently, the PDR was not able to audit and facilitate these projects in the beginning. This has resulted in much discontent.
among the project managers of these projects towards the PDR. However, at the moment, the PDR has been organized and is able to sufficiently audit and facilitate the new projects that have started. Still, my design of the knowledge management system will become a crucial element in the success of the programme Space for the River. If the project managers are able to learn from each other, the burden of facilitating the projects is mitigated for the PDR. Consequently, they can focus more on their initial task: to control and make sure that all projects stay within the conditions as set in the contracts.
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Appendix A: all measures of the programme Space for the River
This appendix includes a list of all the 41 projects that have to be finished before 2015. The projects are along the Neder-Rijn, Boven-Rijn, Lek, Waal, Yssel, Merwede, Amer, Pannerdensch Kanaal and Bergsche Maas.

<table>
<thead>
<tr>
<th>Projects of Space for the River</th>
<th>Governmental institution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boven-Rijn/Waal</strong></td>
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</tr>
<tr>
<td>1 Obstakelverwijdering Suikerdam en polderkade</td>
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<td>2 Extra uiterwaardvergraving Millingerwaard</td>
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<tr>
<td>3 Dijkteruglegging Lent</td>
<td>Gemeente Nijmegen</td>
</tr>
<tr>
<td>4 Kribverlaging Waalbochten</td>
<td>RWS Planstudies</td>
</tr>
<tr>
<td>5 Kribverlaging Midden-Waal</td>
<td>RWS Planstudies</td>
</tr>
<tr>
<td>6 Kribverlaging Waal Fort St. Andries</td>
<td>RWS Planstudies</td>
</tr>
<tr>
<td>7 Kribverlaging Beneden Waal</td>
<td>RWS Planstudies</td>
</tr>
<tr>
<td>8 Uiterwaardvergraving Brakelse Benedenwaarden en Dijkverlegging Buitenpolder Het Munnikenland</td>
<td>Waterschap Rivierenland</td>
</tr>
<tr>
<td><strong>Merwedes, Bergsche Maas, Amer, Rijn-Maasmonding</strong></td>
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</tr>
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<td>9 Uiterwaardvergraving Bedrijventerrein Avelingen</td>
<td>Gemeente Gorinchem</td>
</tr>
<tr>
<td>10 Ontpoldering Noordwaard (meestromend)</td>
<td>RWS Planstudies</td>
</tr>
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<td>15 Dijkverbetering Bergsche Maas/Land van Altena</td>
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<td>17 Dijkverbetering Oude Maas/Voorne Putten</td>
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<td>18 Zuiderklip</td>
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<td>19 Berging op het Volkerak Zoommeer</td>
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<td><strong>Pannerdensch Kanaal, Neder-Rijn en Lek</strong></td>
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<td>24 Uiterwaardvergraving De Tollewaard</td>
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<td>Project Description</td>
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<td>Dijkverbetering Neder-Rijn/Arnhemse- en Velpsebroek</td>
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<td>30</td>
<td>Dijkverbetering Lek/Betuwe/Tieler- en Culemborgerwaard</td>
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<td>Dijkverbetering Lek/Lopiker- en Krimpenerwaard</td>
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<td>Dijkverlegging Voorster Klei</td>
</tr>
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<td>Hoogwatergeul Veessen-Wapenveld</td>
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<tr>
<td>39</td>
<td>Uiterwaardvergraving Scheller en Oldeneler Buitenwaarden</td>
</tr>
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<td>40</td>
<td>Dijkverlegging Westenholte</td>
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<tr>
<td>41</td>
<td>Zomerbedverlaging Beneden-Ijssel</td>
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</table>

**IJssel**

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<tr>
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<td>Provincie Gelderland</td>
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<td>Dijkverlegging Voorster Klei</td>
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<td>Uiterwaardvergraving Keizers- &amp; Stobben- &amp; Olsterwaarden</td>
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<td>38</td>
<td>Hoogwatergeul Veessen-Wapenveld</td>
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<td>Uiterwaardvergraving Scheller en Oldeneler Buitenwaarden</td>
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Appendix B: case studies

Project Scheller and Oldeneler Buitenwaarden
Between the IJssel and the east side of Zwolle lays an area (155 hectare), which includes a nature reservoir, some farms and an old sand extraction put. The Scheller en Oldeneler Buitenwaarden connects the urban suburbs of Zwolle with the recreational areas east of the city. Bikers and hikers are very fond of it. The project includes the construction of a ditch parallel to the IJssel, which fills with flowing water at high water resulting in a reduction of the water level upstream (see figure 26). The sand from the new ditch is dumped into the old sand extraction put, making it better suitable for aquatic fauna and flora. The agricultural identity makes Space for a natural identity. The existing residences and other buildings will stay accessible. The project will include a partly displacement of the drink water extraction puts at the Engelse Werk, as well. The initiator of this project is the municipality of Zwolle. Other stakeholders are:

- Province Overijssel (ABG/KBG)
- Waterschap Groot Salland (ABG/KBG)
- Staatsbosbeheer (KBG)
- PDR (ABG)
- Buurtschap IJsselzone (KBG)
- Municipality of Kampen, (ABG)
- DGR Oost-Nederland (ABG)
- Drink water company Vitens (ABG)
- Landgoed Schelleberg BV (KBG)
- Dienst Landelijk Gebied (ABG)

The goals of the project are:

- To reach a minimum hydraulic task setting of -0.08 meter at river KM 976.2-977.2
- To maintain the natural and original landscape
- To improve the Natura2000 network (Engelse Werk)
- To improve recreational possibilities in the project area
- To contribute to the realisation of the development of the Buurtschap IJsselzone
- To contribute to sustainable drinkwater production
- To dump soil from the ditch in the old sand extraction pit
- To limit the costs of a maximum of € 15,48 miljoen (prijspeil 2003)
- To maintain navigation at low waterlevels
- To maintain access to local residents

The project has passed SNIP2A and is currently designing the ‘Hank’-alternative. A hank is a ditch parallel to the river, but it stops halfway. According to the Q-team, a hank is characteristic for the IJssel that used to meander. The Sounding Bourd Group (KBG) is an institution with local stakeholders that advises the Steering Group. The choice of the KBG was not the Hank-alternative and they are disappointed. This has caused havoc among local stakeholders and negative stories have been published in the paper. Consequently, the members of the ABG are less willing to share knowledge with the KBG (i.e. there is a confidential breach).
Figure 27: Project area Scheller and Oldeneler Buitenwaarden
Project Vianen

The river Lek separates the municipalities Vianen and Nieuwegein. Here, the construction of two ditches and the lowering of summer-embankments and groynes will result in the desired water level reduction. The project-area includes the Honswijkerwaarden, Stuweiland Hagestein, Hagesteinse Uiterwaard and Heerenwaard. The floodplains will become a peaceful place in the busy conurbation of Utrecht. The agricultural activities will be abandoned and replaced by nature preservation areas. The landscape includes different important cultural historical elements like Fort Honswijk, which is part of the ‘Nieuwe Hollandse Waterlinie’. Prominent is the storm surge barrier Hagestein and the highways that cross the Lek at two places (see figure 28). The initiator of this project is the Province Utrecht. Although the project has not yet a sounding board group, the following organizations will probably be included in the decision-making process.

- Municipality Nieuwegein (ABG)
- Municipality Houten (ABG)
- Waterschap Rivierenland (ABG)
- DGR Oost-Nederland (ABG)
- Inhabitants of Vianen and Nieuwegein (KBG)
- Stichting Beheer de Lekuiterwaarden BG
- DURA Vermeer (KBG)
- Projectbureau Nieuwe Hollandse Waterlinie (KBG)
- Municipality Vianen (ABG)
- PDR (ABG)
- Stichting het Utrechts Landschap (KBG)
- Staatsbosbeheer (KBG)
- Recreatieschap Stichtse Groenlanden (KBG)
- LTO (KBG)
- Koninklijke Schuttevaer (KBG)
- Hoogheemraadschap De Stichtse Rijnlanden (ABG)

The goals of the project are:

- To reach a minimum hydraulic task setting of -0.06 meter
- To support the project of the municipalities, including urban development, recreation and ecology.
- To minimize the seepage of water in the municipality of Vianen

Currently, the project team develops a strategy (plan van aanpak). They just started and have not encountered many troubles. The absence of a Sounding Board Group (KBG) makes it easy to communicate, because all members of the ABG and Steering Group are professionals. However, really soon, there will be a KBG. The project is, in comparison to the project Scheller and Oldeneler Buitenwaarden, not far. Therefore, they can learn from the experiences at S&O.
Figure 28: Project area Vianen (source: Google Earth)
Appendix C: summary interviews
This appendix includes a summary of all interviews, which are used to for the evaluation and the construction of the Basis of Design. They are divided in groups in order to provide a better overview.

Knowledge Managers
1) Ingrid Roos Bouwdienst, Rijkswaterstaat
2) Hans Verkerk Maaswerken, Rijkswaterstaat

Stakeholders Vianen
3) Cor Beekmans Riviertakmanagement, PDR
4) Leo van Hulten Projectmanager, Province Utrecht
5) Hans Knotter Member ABG, Hoogheemraadschap Stichtse Rijnlanden
6) Dennis Loenhout Member ABG, Municipality Vianen
7) Johan Haaksman Member ABG, Municipality Nieuwegein

Stakeholders Scheller and Oldeneler Buitenwaarden
8) Erin Hoogenboom Riviertakmanagement, PDR
9) Marjan Vervoort Projectmanager, Municipality Zwolle
10) Hugo van Dijk Member ABG, Waterschap Groot Salland
11) Wil Gerritsen Member KBG, Staatsbosbeheer
12) Adri Wever Member KBG, Buurtschap IJsselzone

Projectmanagers Space for the River
13) Ger de Vrieze en Jelle Sipkema Projectmanager, Waterschap Rivierenland
14) Johan van den Boomgaard Projectmanager, Waterschap Veluwe
15) Leon Reusen Projectmanager, Province Gelderland
16) Luchion Koridon Projectmanager, Municipality Nijmegen
17) Pim Nijssen Projectmanager, Municipality Deventer
18) Yolande van der Meulen Projectmanager, Rijkswaterstaat
19) Hans van Amstel (DGR-project) Projectmanager, Rijkswaterstaat
20) Ide Blok (DGR-project) Projectmanager, Rijkswaterstaat

PDR
21) Hans Luiten Knowledge Management, PDR
22) Regina Collignon Q-team, PDR
23) Steef Severijn Project Control, PDR
Drs. Msc. I.C. Roos is advisor-specialist at the section Innovation and Development of the Bouwdienst, Rijkswaterstaat. She is specialized in knowledge management. This includes facilitating and coordinating knowledge questions that exists among the different units within the Bouwdienst. She identifies knowledge questions by means of personal contact and keeps track of market developments. If a problem exists among many units, she tries to solve it by consulting literature, discuss it with the persons involved, with (top) management or organise a process that leads to the solution. She points out that there is no universal structure to apply for all knowledge areas, as the different characteristics of knowledge areas require different approaches (amount and level of experts and interested people, does it includes the market, some areas are enormous while others are limited).

According to Roos, knowledge management includes everything an organization does to profit of knowledge in the organisation, existing as well as new knowledge. In addition to technical and management knowledge, she points out ‘environmental and organisational and local knowledge’ as knowledge type. This includes the knowledge about important persons in a network of different stakeholders, which support seems necessary to accomplish projects. It is political knowledge.

She validates my findings in the literature by implicating the difficulties of transferring tacit knowledge. Most of the people don’t even realize that they own tacit knowledge. In addition, it often is impossible to make tacit knowledge explicit.

For evaluation criteria she points out that every situation asks for different knowledge management systems and the aspects that are easy to measure are not likely the best indicators of success. Therefore it is hard to indicate if knowledge is managed effectively according to standard evaluation criteria. However, she did manage to name some:

- Has the (project) organization looked around at similar projects in an active way? This does not imply that they should use the knowledge they found, because maybe they concluded that it was not applicable for their organization.
- How many solutions are implemented that were new in other projects?
- Did the (project) organization encounter problems finding knowledge at other organizations? In other words, was the other organisation willing to share knowledge?
- Can the organization indicate the time reduction resulting from knowledge sharing with other organizations?

For my research it implies that the project at Zwolle and Vianen should have contacted each other. If not, they could argue that their situations are not alike, even when their project characteristics, like type of measurement and project environment, are alike. I could consult an independent expert for estimating the similarities in technical and local knowledge. In the end, it is still difficult to evaluate knowledge management in a quantitative matter.

For designing a knowledge management system I need to consider many things. Roos provided a list that should be included in such a system:

- One must gain something from sharing knowledge. If this comes not natural it can be encouraged to let other parties, the ones that only receive knowledge, make explicit what they did with the knowledge. If the sharing party sees that their knowledge contributed to something it could form an incentive to keep sharing knowledge.
• Knowledge sharing must not become a burden, but must become a natural activity. This must be facilitated by making it a part of the job-description and by giving people time to do it.
• (Top) management must support active knowledge sharing by emphasizing its importance.
• Create extra capacity for employees to work with each other for a while in order to exchange tacit knowledge.
• Discuss subjects in meetings that are problems to all attendants. This will result in discussion where knowledge is shared more easily.
• The knowledge sharing objectives should correspond with the organizational goals.
• The sharing of knowledge must not consume too much time. The ‘normal’ activities should not be hindered too much (not: sharing for the sake of knowledge sharing. The goals are always related to the primary process).
• Establish websites for project-stakeholders that they could access with a password. Here they can access important documents and discuss on a ‘prikbord’ or forum.
• Finding contact information quickly is very important.
• Establishing public websites for general information and contact information about multiple projects will stimulate knowledge sharing.

Roos has provided me with new insight and partly validation for the findings I did in the literature. She likes to receive my final report in October.

Interview Ir. Henk Verkerk
Maastricht, 19 June 2007

Mr Verkerk is head of the Knowledge Department at the Maaswerken. This unit has the task to consolidate knowledge from the Planning phase in order that it can be used in the implementation phase. This implies that knowledge is stored and made easily accessible. This is needed because many people leave the organisation after the Planning phase. Another task is quality control. The unit monitors if the plans are in line with the Basis of Design as set in the Planning phase. In addition, Mr. Verkerk advises the Head-Engineer Director (HID) of the Maaswerken as well as the separate project-managers. Other activities include managing of the people of his department, advising on hydraulically and navigation problems and attending meeting for knowledge exchange.

He has finds it difficult to formulate a definition for knowledge management due to its complexity. However, he indicates that it is a combination of people and documents. Also, a lot of knowledge can be made explicit, but not transferable to others. That is why every document requires an explanation of the process behind the document. This implies that a document includes the names of the writers, which decision are made and why and what other options were possible.

The literature provides some types of knowledge; technical and management knowledge. Verkerk agrees, but adds local knowledge to it. This includes the geographical aspects of the project (houses, cables, size, landscape, etc) and the political situation (stakeholders and their core values as well as other projects). He points out that management must base its decisions on technical knowledge and local knowledge, but also on budget and planning.

The project Maaswerken has a HID, a secretariat, 4 project teams, staff bureaus (a Knowledge Unit, a Juridical Unit, Communication, purchasing land). The plan phase has been done completely by Rijkswaterstaat. The implementation phase is done, if possible, in a public-private partnership; no local government as initiators like the project Space for the River.
Knowledge management is almost unknown in the project Maaswerken. The project-managers are very busy with their deadlines and their priority is not looking around and to learn from other projects. Sometimes people like Verkerk, indicate to a manager that other managers have the same problem and that they should talk to each other. This prevents major problems, but a systematic exchange of knowledge is not present. The lack of knowledge exchange initiatives results in isolated projects that sometimes don’t even know that the other project is working in the same area. Knowing this should result in combined communication to the local people or administrators. Other problems were the different formats that the project-teams deliver to the Knowledge Unit, which results in difficulties regarding quality control. Verkerk points out that effective knowledge exchange depends on the person. It is the will of the people that is needed, because they have to accept that they don’t know everything and that they should learn from each other by exchanging knowledge.

Looking to the archiving procedure can identify indicators that knowledge is exchanged effectively. Knowledge must be stored proper (same format, names, dates, codes) and must be accessible at all times. Especially the process behind the document must be made explicit. Why have certain decision been taken and how? Another indicator is if key positions in the organisations belong to bureaucrats and not to consultants. Usually, the bureaucrats stay at the project as well as their knowledge.

On the question: “what methods or techniques are helpful for effective KM?” Verkerk gives the following:

- Good documentation (as mentioned before)
- Database accessible for everybody in the organization
- Make PDF files of documents with signatures
- Managers must encourage knowledge exchange
- Search engine (Google like) for the database
- Milestone documents (important decisions must be backed up by a number of documents that are documented properly)
- Create knowledge demand otherwise exchanging knowledge is ineffective.
- Share success stories and learning moments
- Keep telling people that exchanging knowledge is very important and that it should become a daily activity.
- Knowledge management is only effective if everybody does it.

When interviewing the stakeholders in the case studies, Verkerk suggest asking what an organisation knows about other organisations. This can be verified by interviewing these other organisation. This way, I can test if they know each other and if they exchange knowledge.

At the end of my research, Verkerk likes to receive a digital copy of my research report.

*Interview Cor Beekmans*
3 July 2007, Den Haag

Beekmans is riviertakmanager and has the project “Uiterwaardvergraving Honswijkerwaarden, Stuweiland Hagestein, Hagesteinse uiterwaard en Heerenwaard” under his supervision. He states that the meetings of the Stuurgroep are shallow. Some stakeholders don’t read all the documents and the discussion about it is abstract. In addition, the bureaucrats are discussing other things and are more detached than their administrators in the Stuurgroep. Beekmans knows all the
representatives, core values and standpoints of all stakeholders, but again on an abstract level.

Their has been some contact with the project Overdiepsche Polder, but it seems that the projectmanager is busy with other things instead of exchanging knowledge with other projects. In addition, the projectmanager was absent the last projectmanagers day. The project acts too solitaire. However, they used some knowledge about tendering and ‘plan van aanpak’ of the Overdiepsche Polder. Beekmans provided knowledge from the project ‘dijkteruglegging Lent’ and organized meetings with the Q-team, hydraulics people and cost estimation people from the PDR. Part was demand-based. This knowledge exchange resulted in new ideas and time benefits.

Beekmans wants to identify best practice together with the other riviertakmanagers. In addition, he wants different knowledge groups for certain subjects. This requires leading projectmanagers or PDR-people, who are dedicated and functional. These groups must only exist temporary and should not be kept alive when it has become abundant (intervisie). Again, supply and demand should be in balance. This could be done by a central databank where all stakeholders can get information and knowledge. This must be subject-based and phase-based, where all the same types of documents are stored together. He prefers a network between project managers alone without PDR-people. A condition is that documents are treated confidential. For example, important and confidential pieces of text could be made unreadable. Another condition for a knowledge management system is that there should be no competition and people should give and take.

Beekmans could deliver knowledge about process and the connection with content and decision-making. This is best transferred face to face, because it is difficult to document.

A precondition for a knowledge management system is that it should not be dominated by the PDR. They should not indicate how projectmanagers should exchange knowledge. It also must not become a acquisition-forum where al kind of RWS-diensten or consultancy firms offer their surfaces. The system should only be for the projectmanagers and the PDR.

The projectmanagers day is very effective. The projectmanagers act professional, which result in synergy. However, there were too many PDR-people that should not be there. It must be day for the projectmanagers. A last remark is that everybody should sign in on time. Than the location good be better adjusted to the amount of people that join this day.

Beekmans like to receive a digital copy of my research report.

*Interview Leo van Hulten*
27 June 2007, Utrecht

Van Hulten is project manager at the project “Uiterwaardvergraving Honswijkerwaarden, stuweiland Hagestein, Hagesteinse uiterwaard en Heerenwaard”. He indicates that his specific knowledge, in comparison to the other stakeholders, includes process management. He is able to use his knowledge to facilitate the decision-making process in a complex environment (many stakeholders, different values, interdependencies, many procedures) He uses his knowledge mainly in the weekly or monthly meetings with other stakeholders. During this meetings the atmosphere is positive critical. Everybody tries to contribute to the project, but without deviating of their interests and standpoints. Van Hulten has not encountered trouble getting certain information of other stakeholders. The ‘Externe projectgroep’ (Ambtelijke Begeleiding Groep) operates well. They started with an excursion with all stakeholders to the project area by bike, which created a bond immediately according to van Hulten. The ‘Stuurgroep’ has more trouble to come to
decisions. There is not yet a klankbordgroep.

Currently, he is working with his project-team (5 persons) on the project strategy (Plan van Aanpak). He knows all the stakeholders personally, which increases knowledge exchange. The representatives of the stakeholders have not changed since last year. This helps in the good relationships between the stakeholders. However, Van Hulten will leave the project in July. He claims to know all the core values and standpoints of other stakeholders. As a test, he has to mention them of the Waterboard Stichtse Rijnlanden. (The waterboard is responsible for the dikes, which are in line with the safety norms at the moment. They don’t want the project to affect the safety of the dike. Van Hulten indicates that their input is limited). Currently, all stakeholders of the ‘externe projectgroep’ have access to a website for exchanging documents.

He has contact with the project manager of Overdiep on a regular basis. He also phoned the projects Noordwaard and Deventer requesting their project strategies. He uses their knowledge for constructing his own strategy, because these projects are further ahead. These documents have helped him to make certain decision, which saved time and had a positive influence on the planning. On the other hand, he has no idea what is going on at the project “Scheller en Oldeneler Buitenwaarden” at Zwolle, which is a similar kind of project.

According to van Hulten, the project manager’s day was very interesting and very important for knowledge exchange. The exchange of knowledge happens mostly in informal ways at the coffee table or during sessions. He prefers less general presentations and more presentation concerning specific subjects like MER, acquiring land, process design.

Van Hulten prefers to receive more knowledge about financial planning and dealing with risk and planning. He likes to have personal support by someone from the PDR concerning project control. External knowledge for subjects like ecology, hydraulics and process is not needed. In general, he has trouble dealing with the aspects that come along with such a big project and the accountability to an external organization (Rijkswaterstaat). Normally, these projects are done by Rijkswaterstaat themselves.

On the other hand, the project team can provide knowledge about process management. They can indicate how to make progress with contradicting stakeholders, how to organize that and how to create commitment among the stakeholders. This knowledge could be exchange during a project manager’s day, because it is difficult to document. A knowledge exchange system should not be obligated. People should be able to choose to exchange knowledge.

_Interview Hans Knotter_
28 June 2007, Houten

Knotter is responsible for the dikes at the Hoogheemraadschap Stichtse Rijnlanden. His knowledge includes geohydraulics, stability of the dikes and everything that comes with it. Mostly, he exchanges knowledge with the other stakeholders of the project “Uiterwaardvergraving Honswijkerwaarden, Stuwewiland Hagestein, Hagsteinse uiterwaard en Heerenwaard” during the meetings. He stipulated that some knowledge cannot be documented and can only be transferred through discussion. Technical knowledge is based on facts, which can be transferred through documents more easily. This happens through a website that is accessible for all stakeholders in the externe projectgroep. At the moment, Knotter has not encountered problems acquiring knowledge from other stakeholders. However, he has not asked for it a lot because the project has just started. At the moment, there is no contact with other projects in Space for the River. During the PKB phase
they had some contact with other projects.

Approximately, the stakeholders have meetings two times a month. The atmosphere is positive and there is good cooperation. Knotter has the phone numbers of all stakeholders and could call them for certain knowledge. He thinks that he knows all the interest and core values of the other stakeholders. For the municipality of Nieuwein it is 1) expansion harbour 2) transforming Bossewaarden into “stedelijk uitloopgebied”. The standpoints of the Hoogheemraadschap Stichtse Rijnlanden are 1) safety according to the norms, no dike-strengthening 2) No seepage. In other words, if possible, no adjustments at their dikes.

Knotter likes to receive more knowledge about the development of nature and in to what extend that is going to happen. He thinks this knowledge must come from Rijkswaterstaat. In addition, he likes to receive more information about the planning of the project, because some procedures are new. He likes to receive this information officially and posted to the Hoogheemraadschap Stichtse Rijnlanden. That way, it does not stay somewhere in an inbox of his mail and are other persons better capable of getting that information.

He is willing to share all his knowledge, because he does not like secrets and strategic behaviour. In the end, they are all working for BV Nederland. This happens mainly during the meetings. Geotechnical information can be stored at the database (website), like waterlevels and effects of more inundation. Knotter wants to see that his knowledge is used and taken into account. This is important, because in the end, they have to issue some permits to the project.

For a knowledge management system he likes:

- Transparency
- Good archiving (so same documents in the same folder)
- Search Machine
- Forum
- Contact data of representatives of other Waterboards that are involved in projects of Space for the River
- A special folder for issuing permits in such kind of projects

Knotter likes to receive a digital version of my report in October

*Interview Dennis Loenhout*

3 July 2007, Vianen

Loenhout is the representative for the municipality of Vianen in the ambtelijke bestuursgroep (ABG) of the project “Uiterwaardvergraving Honswijkerwaarden, Stuweiland Hagestein, Hagesteinse uiterwaard en Heerenwaard”. During the monthly meetings of the ABG, the stakeholders share knowledge covering many subjects. This happens in een open and constructive matter. Although, some stakeholders have little input. Loenhout thinks that it is inherent their character. All outcomes of the discussion are summarized and documented. Loenhout has knowledge about culture, environment, technique and spatial planning, mostly from previous jobs. Outside these meeting, there is almost no contact between the stakeholders, because everybody is busy with other things. Most stakeholders show no priority with this project. Although, he knows all other stakeholders and their phone numbers.

The core value of the municipality of Vianen is to fix the seepage problem. They also want a good decision-making process. Loenhout thinks he knows the core values of all stakeholders. As a test,
I asked the core value of the municipality of Nieuwegein. Loenhout thinks that they also want to fix their seepage problem as well as minimizing the costs to fix it. He stipulates that all political sensitive subjects should be in the open during an ABG in order to identify the bottlenecks in the decision-making process. Otherwise, stagnation will occur and delay the project. However, this is not possible during a Stuurgroep meeting, because that is often communicated to the public.

He has no contact with other projects in Space for the River due to his busy schedule. This is the responsibility of the project manager from the province of Utrecht.

Loenhout likes to receive knowledge about seepage remedy techniques. He can offer his knowledge, but don’t want to be disturbed too much. He has a busy schedule and the municipality has other priorities. In the end, knowledge sharing is the responsibility of the project manager. A condition for knowledge sharing is that he doesn’t have to answer immediately. Another condition is that knowledge should be handled confidential. If knowledge is shared through a website with password, it should not become a chatsite. He likes to see when meetings are, what the subject is and who will be present. The database should not include too much information.

Loenhout likes to receive a digital copy of my research report.

Interview Johan Haaksman
16 July 2007, Nieuwegein

Haaksman works for the municipality of Nieuwegein, which is stakeholder in the project “Uiterwaardvergraving Honswijkerwaarden, Stuweiland Hagestein, Hagesteinse uiterwaard en Heerenwaard”. He is a member of the Ambtelijke Begeleidings Groep” (ABG) and looks after the interests of the municipality. They like to transform the part of the Bossewaard between Nieuwegein and the Lek into a recreational zone. This transformation is in line with their urban development plan of 2003. Additionally, they like a bigger marina. However, the land belongs to a farmer and Rijkswaterstaat and the municipality has no money to spent for this project, which makes the municipality dependent on the project.

The municipality has knowledge about the local wishes and demands, the landowners and about the current situation of the area on many levels. They have contact with local inhabitants, who like to know what is going to happen in their environment. They exchange this knowledge with the other stakeholders in the project like the waterboard Stichtse Rijnlanden, province Utrecht and municipality Houten. There will be a common database for all stakeholders of the ABG, accessible through a website, where they can up/download all kind of documents. Haaksman did not have any troubles gathering information from others and has often contact by e-mail or phone. He states that most e-mail provides sufficient knowledge. Additionally, the ABG has a meeting monthly and sometimes more often. The atmosphere during these meetings is very good. Everybody realizes that they are depended on each other and the stakeholders help and support each other on many subjects.

Haaksman states that he knows everybody in the ABG and has all his or her e-mail and phone numbers. Occasionally, he calls the project manager and discusses the aspects that are not totally clear to him. He also states that he knows everybody’s core values and standpoints. For example, the municipality of Vianen wants no seepage and wants a marina as well. Their own standpoints are development of recreation facilities in the Bossewaard together with nature development and a bigger marina. Therefore, the municipality prefers scenario 1; a gully through the Bossewaard.
He has no contact with stakeholders of other projects in Space for the River, although it seems very interesting and helpful to exchange certain knowledge with other municipalities. At the moment, most knowledge questions are handled internally, but he likes to receive knowledge about hydraulics and acquiring land from the landowners. Haakmans states that the project is still young and knowledge exchange will increase later on.

Haaksman is willing to provide all his knowledge to other stakeholders except detailed financial data or political sensitive information. A precondition is that knowledge is only applied for the project and is not used at other issues without their permission. He likes to exchange knowledge by documents, e-mail and presentations.

The knowledge management system must not be free of obligations. People who want to use it have to register and therefore commit themselves to active participation by following the rules. The system must provide an answer quickly if someone had a knowledge question, preferable in 24 hours. Knowledge must be accessible quickly with help from a search engine.

Haaksman likes to receive a digital version of my graduation report in October

Interview Erin Hoogenboom
26 June 2007, Den Haag

Hoogenboom is vice-riviertakmanager of the IJssel and represents the PDR in the project Scheller and Oldeneler Buitenwaarden. As a counterpart of the projectmanager he tries to acquire sufficient knowledge from all disciplines to be able to facilitate the project. His knowledge about administrative/political aspects and process-management is specific knowledge he posses. Knowledge exchange stretches from indicating to stakeholders where certain knowledge is available to having meetings with the stakeholders themselves. Most knowledge in this project is stored at DLG, because they are the secretariat. Knowledge stored at PDR is mostly official documents and documents for projectmeetings. This knowledge is not available online for all stakeholders, however, and the project manager has requested a virtual meeting-Space.

Knowledge at the PDR is available when needed (for instance when a SNIP2A advice was given for the Scheller project). Knowledge is exchanged sufficiently between stakeholders in an open atmosphere according to Hoogenboom. He finds the atmosphere during meetings with the project team relaxed. He knows most stakeholders and their core interests. For example the province Overijssel has two roles, one of initiator Westenholte and the other as competent authority for nature development. This situation can be confusing, but their points of view are clear. The municipality has also a double role, as initiator of the Scheller project en as competent authority of urban planning.

Knowledge exchange with other projects goes through personal unions; persons work in several projects. For instance, Vervoort is project-manager S&O, member of the ‘Kernteam’ together with Westerholte and project-secretary in the projects at Deventer. One person represents Rijkswaterstaat Oost-Nederland in all projects in the IJssel. These people, together with Hoogenboom as vice-riviertakmanager transfer knowledge between projects. In addition, knowledge exchange between projects occurs during the Project-managers meeting day. In most cases, other projects learn from S&O (Vervoort), because they are ahead in execution. They have figured out subjects like European tenders (Pakket van Eisen, price-quality), level of detail and reality of the alternatives that are considered in the planstudies and the complexity of hydraulic calculations.
According to Hoogenboom, the following subjects must be exchanged between projects:

- How to realize such projects, because most of it is uncommon to local government. The Knowledge Unit at PDR can facilitate this by using lessons learned from other Rijkswaterstaat projects.
- How to accelerate the implementation of projects
- How to do procedures for permits effectively and efficiently
- Transport of soil between projects
- How to use the market better
- Change in laws and rules (soil, spatial planning, water) and how to implement that

This knowledge should be exchanged by:

- Workshops between project managers and experts for certain aspects (discussion).
- Website for certain subjects with passwords (documentation). Important is that documents are up to date, not multiple versions. This demands discipline for all stakeholders. In addition, only negotiated knowledge should be posted on the site. In other words, not every individual should post information that he or she finds useful, first discussion. And only after a second filter (stuurgroep) should knowledge made public.

A condition for knowledge exchange is that experts or project managers do not take standpoints during knowledge exchange events, because this limits the exchange. One should explicit exchange knowledge and take these standpoints at certain point later on. Making clear this situation prevents confusing about the standpoints of certain stakeholders and facilitates knowledge exchange.

Ir. E. Hoogenboom likes to receive a digital version of my graduation report in October

Interview Marjan Vervoort
4 July 2007, Zwolle

Vervoort is projectmanager at the project “Uiterwaardvergraving Scheller en Oldeneler Buitenwaarden” at Zwolle. Normally, she works for the DLG, but at the moment is the replacement of the projectmanager for the municipality of Zwolle. She has knowledge about the PKB-phase and about other projects like NURG. As a projectmanager, she knows the daily activities and provides the other stakeholders with information by delivering documents for the meetings. During this meeting, 6 times a year, the atmosphere is open and there are discussions about various subjects. Knowledge is exchanged during this meetings and sometimes Vervoort goes to presentations of other stakeholders or gives presentations. In the beginning the stakeholders had a field trip. There is no common database with all stakeholders where they can access, retract and place documents any time anywhere. However, there is knowledge exchange with the project Westerholte. This project has the same Projectgroep and Stuurgroep. She knows all the stakeholders and often calls them for polling their status and standpoints. She did this in the beginning as well to identify what documents when should be delivered to certain stakeholders.

She has problems acquiring knowledge from the PDR, because the PDR is still shaping their own organization. Still, some answers have not been answered and this results in delays, like the MHW subject. Within the project, some stakeholders don’t consult with their organization and speak for their own behalf. This results in problems afterwards. She knows all the core values of all stakeholders. For example, the waterschap Groot Salland wants no negative effect on the dikes and likes to know about the seepage.
She has and had often contact with other projects (Vianen, Avelingen, Overdiep, Deventer, Munnikenland). Mostly, the projectmanagers of these projects provide knowledge to others, directly or through the PDR. In the case of the project Overdiep, they received knowledge about the SNIP2A tender, which resulted in a more structured discussion. She had contact with the project at Vianen and knows their situation. They exchanged knowledge about many subjects. Once, together with the project Overdiep and Noordwaard, they planned to have a meeting about SNIP2A. It never happened.

The location of the second projectmanagers day was difficult to access. She likes the carrousel and the networking. She also liked the fact that there were many projectmanagers. However, she wants knowledge (from the PDR) about the implementation phase, about licenses and procedures. She wants the PDR to look to the future and act on it. Keep ahead of the projects. Maybe, the PDR must be split up towards a section till SNIP3 and a section for the implementation phase.

Knowledge about the implementation must be available when asked, but also be delivered pro-active. She likes a database where all documents are stored subject-based together with the phone numbers of the writers. Projectmanagers should provide the moderator with documents and he/she will post it onto the database in the correct folder. In addition, she likes knowledge transfer face-to-face. Therefore, the PDR should organize more field trips and visit the projects more often.

Vervoort likes to offer all her knowledge by phone, presentations or documents. She prefers the informal networking due to its cross pollination. But it should not endanger her own work and deadlines and should work in her advantage in the end. Compensation by the PDR for the time that is spent for exchanging knowledge with other projects would stimulate this process.

Vervoort likes to receive a digital version of my report in October

Interview Hugo van Dijk
6 July 2007, Zwolle

Van Dijk is policy officer spatial planning at the Waterschap Groot Salland. He is the representative in the Ambtelijke Begeleidingsgroep (ABG) and Klankbordgroep (KBG) of the project “Uiterwaardvergraving Scheller en Oldeneler Buitenwaarden” at Zwolle. They have knowledge about the hydrology and geology of the area.

They exchange knowledge with Vitens, the PDR, province Overijssel and municipality of Zwolle about many things, for example groundwater-levels or robust designing. The meetings are often restricted to only giving comment to the documents. He states that the meetings are too informative and he misses the content related discussions. The ABG has a meeting four times a year, but sometimes he speaks to its stakeholders elsewhere. He has not contacted anyone yet for requesting information although he has all phone numbers.

He indicated that he knows the core values and standpoints of most of the stakeholders in the ABG and KBG. However, he does not know them from Staatbosbeheer. Their own standpoints are 1) no influence on the dike stability 2) minimum seepage behind the dike and 3) realizing Space for the River.

He has contact with the project ‘Dijkverlegging Westerholte’, because it has the same ABG. He also knows the ins and outs of the project at Kampen, because this project is in the jurisdiction of
the waterboard. Other than these projects, he has no contact with Space for the River projects.

There is no urge for sharing knowledge with other waterboards at other projects of Space for the river, because it is a relatively simple project for the waterboard, although it could be helpful in the future. Instead, van Dijk likes to know the details of the hydrological researches that have been done at Scheller and Oldeneler Buitenwaarden.

Van Dijk is willing to provide knowledge to other projects at Space for the River under no restrictions, because most of it is public. Especially, knowledge from the project Westerholte can be beneficial for others, like dike-relocation plans, but also the researches of Scheller and Oldeneler Buitenwaarden.

Not all documents in a knowledge management system should be unreadable for the common people. It must be understandable. The fact that everybody is speaking for themselves instead of their organization is another aspect that should be prevented.

Van Dijk likes to receive a digital copy of my research report.

*Interview Wil Gerritse*

6 July 2007, Olst

Gerritse works for Staatsbosbeheer and is a member of the Klankbordgroep (KBG) at the project “Uiterwaardvergraving Scheller and Oldeneler Buitenwaarden”. This project is also a GIOS-project (groen-in-om-de-stad) and a natura-2000 project. Subsequently, Gerritse has a long history with the Scheller and Oldeneler Buitenwaarden. Already, they own and maintain the two areas at both sides of the projects-area; Engelse Werk and Olderneel. That is why they want to become the maintainer of the project area as well. It is therefore very important to be involved during the decision-making process.

Staatsbosbeheer has knowledge about the grazing of land, about fauna and flora. Also, the combination between nature and recreation belongs to their expertise. This knowledge is exchanged during the meetings of the KBG. This goes well in comparison to other projects. The meetings of the KBG are approximately 3 times a year. The atmosphere has changed from hostile to cooperation. The stakeholders in the KBG realize that they can’t stop the project and have to cooperate in order to realize their remaining wishes. However, there is not a lot of detailed discussion, which is caused by the big number of stakeholders. In addition, the representatives of these stakeholders change a lot, which affect the mutual contact. According to Gerritse, more fieldtrips (to other projects) should stimulate cooperation and knowledge exchange. He indicates to know all core values and standpoints of the other stakeholder. For example, the waterboard Groot Salland wants stability for the dike, limited seepage and access to the dike.

The standpoints of Staatsbosbeheer for this project are:

- Become maintainer
- Two types of nature (process and patron)
- Blending recreational and nature aspects
- Information-panels about the area
- Compensation of land for meadow birds

Gerritse has contact with “Uiterwaardvergraving Duursche Waarden” and “Keizer en Stobbenwaarden en Olsterwaarden”. A lot of knowledge is used, such as knowledge of different kinds of gullies
in combination with vegetation and water flow. In addition, they provided knowledge about safety for grazing animals during floods and preventing recreation to become a barrier for nature development. This knowledge is exchanged by mail to the municipality of Zwolle, in order to confirm it and prevent confusion afterwards.

He finds contact with other projects important in order to keep up to date. When he reads about projects and finds it interesting, he calls or e-mails the project-manager for more information. The other way around, he can provide knowledge about maintaining aspects and educating the local stakeholders. For example, ones they send a map with stickers to all local inhabitants and they could layout the project themselves. This creates support, because people have to think about the project and this result in discussion. All knowledge of Staatsbosbeheer is public, so there are no preconditions for knowledge sharing with other stakeholders in the project or projects of Space for the River. Ones, they organized an excursion with multiple KBG’s, which was a big success.

In a knowledge-management-system information should be complete in order to prevent non-issues to become subject of discussion. It takes a lot of time and money to convince people that it is a non-issue by extra research. There should also be negative and critical notes to make it a transparent system.

Gerritse likes to receive a digital copy of my research report.

Interview Adri Wever
4 July 2007, Zwolle

Wever is chairman of the Buurtschap IJsselzone, which is a stakeholder in the project ‘Uiterwaardvergraving Scheller en Oldeneler Buitenwaarden’. They represent the local inhabitants and organizations by giving advice from the klankbordgroep (KBG) towards the Stuurgroep. He stipulates the knowledge gap between the project-group and klankbordgroep. Many of the reports and documents are difficult to understand and take a long time to read. Often, these documents are delivered a week in advance, which is not long enough for the klankbordgroep to read them all. Soon, the chairman of the klankbordgroep will be present at the Stuurgroep, which should close the knowledge gap. In addition, the klankbordgroep will meet more often.

The Buurtschap IJsselzone has a lot of local knowledge. For example, scientific research indicated no seepage behind the dikes, but the farmers know that at high water levels at the IJssel, there is seepage. They did another research and that confirmed the seepage. The Buurtschap has the mission to be transparent and open to everybody, but it is difficult to go to a meeting and not make a decision beforehand. The same applies to the project-group, which often presents their vision at a KBG meeting. This results in resistance by the local inhabitants. The best example is the decision of the project-groep to reject the advice of the KBG and implement the ‘Hank’ of the Q-team from the PDR. This made them very angry and dislikes the people in The Hague even more. The municipality of Zwolle, initiator of the project, should stand up towards the PDR when deadlines must be delayed in order to formulate a proper advice. They did not to this and the KBG had to reformulate their advice about the Hank in only two months.

Wever wants more transparency about the decision-making process in order to formulate a good advice. Often he must formulate an advice, but has not all the details. He understands the difficulties around confidentiality, but thinks that everything should go public. Things that are kept secret are more interesting and reach the papers. If everything is accessible it will not be as interesting for papers. He also wants the translation of technical report in ‘normal’ language that is readable for the common men.
He likes to know the effect of the project on other projects in Space for the River. What are the mutual dependencies? It will help the people to develop a feeling that they contribute to a bigger project.

He likes to have contact with other KBG’s in order to exchange knowledge about the process. How did they do it? He thinks it is most helpful to help each other in the beginning with the strategy. Wever likes the idea of organizing a KBG-day where representatives of all KBG come together and give each other presentations and have discussions. In addition, they could have excursions towards other projects. This should create a we-feeling and maybe people are even more willing to cooperate in their own project. The KBG-day will increase the capabilities of the chairman, which will benefit the own KBG.

Interview Ger de Vrieze and Jelle Sipkema
3 July 2007, Tiel

De Vrieze and Sipkema are the projectmanagers of the project ‘Munnikenland’. This project includes many stakeholders like provinces, municipalities, a waterboard and local organizations. This situation is new for the waterboard of Rivierenland. The stakeholders are divided in three different groups; the Stuurgroep, Ambtelijke Begeleidings Groep (ABG) and the Klankbordgroep.

The stakeholders in the ABG exchange knowledge and information during their meetings, approximately 9 times a year. The meetings have an open character. Everybody shares knowledge, also outside their standpoints. Occasionally, de Vrieze sends everybody a kind of update-mail about the current products and process steps in order to keep the stakeholders involved. They have almost no mutual consultation with other stakeholders besides the ABG meetings. They are all busy with other projects and therefore not very active outside the meetings of the ABG.

De Vrieze likes to have a mutual database for all projects in Space for the River where he can find and donate important documents. He prefers concepts instead of official documents, because they include more information. He also likes a kind of forum where he can post questions. At this moment, some knowledge about other projects comes from the people at DLG, because they work with some other projects in Space for the River. Examples are subjects like tendering and constructing of progress report and cost-calculation.

The project has no explicit knowledge strategy or goals. There are ambitions to exchange knowledge with other project in the Netherlands and Europe, but that is still vague. However, knowledge is exchanges with other project of Space for the river during the projectmanagers day. In addition, de Vrieze had some contact with other projectmanagers by phone, asking for certain documents. They used that knowledge for their own project and indicated that to the projectmanager that gave the documents. This makes people more willing to share knowledge. If you see that your knowledge is used, knowledge exchanging becomes fun. The use of knowledge of others has resulted in time reduction and new insight. In the end, Space for the River is new for all local governments and you should help each other as much as possible. De Vrieze thinks that they should pay more attention and time to knowledge exchange, but they are very busy with their daily activities.

De Vrieze likes to know which projects are in what project phase, because than it is possible to email them for consultation. This information must be updated every quarter and send in a kind of newsletter to all projectmanagers. In addition, they like to receive knowledge about a progress
security system and about an instrument for balancing the many interest and creating a spatial
certainty framework. This can be done by document and face-to-face. De Vrieze indicates that they
are willing to share all knowledge, but not all small details like a detailed cost calculation. However,
knowledge should not be misused. Private companies should not gather certain knowledge in order
to charge others for it. Knowledge should be used in confidentiality.

The knowledge management system should be user-friendly, orderly and should result in the
right knowledge very quickly. There should be no pollution of old and out-dated documents. Projectmanagers must post information quickly (the day after they have finished it) in order to
make it available and useful for others.

The projectmanagers day was good, but the general presentations were not as interesting in
comparison to the carrousel. The projectmanagers should have discussions and exchange
experiences instead of discussion between projectmanagers and people from the PDR. The day
was well prepared, but it was a long day. They prefer meetings with other projectmanagers about
a certain subject and not a whole day.

They both like to receive a digital copy of my research report.

*Interview Johan van de Boomgaard*
10 July 2007, Apeldoorn

Van de Boomgaard works for waterboard Veluwe and is projectmanager of the projects
“Dijkverlegging Voorster Klei” and “Dijkverlegging Cortenoever”. They are working together with
the project “Hoogwatergeul Zutphen” or “IJsselsprong”, which is an alternative (omwisselproject).
They have the same Stuurgroep including the municipality of Zutphen, Brummen and Voorst, the
PDR, VROM, Rijkswaterstaat Oost-Nederland, the waterboard Veluwe and province Gelderland.
The Klankbordgroep (KBG) includes local organizations like Staatsbosbeheer, environmental
organization, estate-owners, inhabitants, Schuttevaer and several organization looking after
the interest of recreational parties. The project team exists out of employees from different
organizations like the province Gelderland, the Municipality or the waterboard. So most of the
‘Ambtelijke Begeleidings Groep (ABG) is active in the project-team. Each sub-project is managed
by the appropriate organization, the best man for the job. A lot of the research is done by private
parties to ensure the speed of the process.

The ABG exchanges a lot of knowledge. During the general meetings, but especially at the
meetings of sub-projects. The stakeholders provide each other information where possible and
specialized knowledge comes from external consultancy-firms. The ABG has a monthly meeting
and the atmosphere is good. In the beginning, the ABG had a fieldtrip and a barbeque, which set
the foundation for good cooperation. In addition, they did a “Belbin” to assess the capabilities of
all team-members. The project-team, and therefore most of the stakeholders of the Stuurgroep,
have access to an intranet. The project-team members work often together in the same building,
where they can exchange knowledge through the intranet. Therefore, van de Boomgaard
knows all core values and standpoints of the other stakeholders. He states that they have no
explicit knowledge-management goals in their projects.

The waterboard is stakeholder in many projects of Space for the River. Additionally, they have
contact with other waterboards that are stakeholders in other projects of Space for the River.
As a projectmanager, van de Boomgaard had contact (by phone or e-mail) with the projects
Munnikenland and the projects at Deventer. He received knowledge about ‘plan van aanpak’ and
the ‘bestuursovereenkomst’, as well as other subjects. This saved time, money and increased the quality of decisions and products. It made it possible to fine-tune there products. Not many new ideas have come to their project team.

Van de Boomgaard likes to receive knowledge about approaching the market (tendering and maintenance). Knowledge exchange should happen by interaction. The other way around, van de Boomgaard can deliver knowledge about handling an ‘omwisselbesluit’. How to organize the project-organization. Preconditions for knowledge sharing is that van de Boomgaard must have time available and that information, like GIS-data, should be treated confidentially, because it has a patent.

The project managers day should allow more time for informal interaction. Additionally, presentation could be presented on the wall and not with PowerPoint, because it will result in more interaction. The lay-out of the day was good as well as the location. It is important that the location is central.

A knowledge management system should not include judgements about engineering or consultancy firms. According to van de Boomgaard, each project is different and these firms should not be judged mainly on the experiences of one project or person. They should be given a second change. The system should include a search engine. Additionally, some documents must be placed at different subjects to increase the search-results.

Van de Boomgaard likes to receive a digital copy of my research report.

Interview Leon Ruesen
2 July 2007, Arnhem

Ruesen is project manager of the project ‘hoogwatergeul Veesen-Wapenveld’. This project is done by the province Gelderland. Other stakeholders are the municipality of Heerde and Olst-Whije, Waterschap Veluwe, PDR, Rijkswaterstaat Oost-Nederland, LNV, VROM, Province Overijssel and a number of local organizations like inhabitants, farmers, environmental groups, entrepreneurs and more. At the moment of this interview, the project has no contract with the PDR, but already a number of meetings with the locals as well as a meeting on administrative level have been taken place. From August on, the Stuurgroep will have a monthly meeting. The meetings with local organizations were difficult, because these organizations are against the project. They have to transform from an opponent into a partner. This will not be easy due to the negative experiences with Den Haag during the MKZ-crisis. Their support is essential, because they own a lot of local knowledge.

The project is the last project of Space with the River that starts and has the intention to learn from the other projects as much as possible. This should help to gain time and finish before 2009. Ruesen thinks that Rijkswaterstaat has not a lot of additional knowledge to offer in comparison to their network. However, they could offer knowledge about purchasing of land, hydraulics and damage claims. Ruesen supports the project managers day, because it offers a good platform in order to make contact with other project managers and exchange phone numbers and knowledge. The next step is to make contact with similar project, as well for process as for content. He estimates that this will consume almost 50% of his time the next 6 months.

Ruesen stipulates that the accessibility of information at the PDR is poor although it is one of the goals of the PDR to facilitate knowledge sharing. The only way to gain information is through the
riviertakmanager. He complaints that it is unclear what knowledge is available, who to contact and how to get there. The PDR should empathize with the project teams what kind of knowledge they want. Knowledge management should start with the project teams and not at the PDR. The PDR should be aware that it is essential to think like a project team and not the other way around.

A knowledge management system should be user friendly. Information should be categorized in subjects and phases in order to get to the right information quickly. Databanks of all the projects should be linked in order to find information through a search machine. It is also possible to exchange knowledge through a person, but this person should always be accessible. Ruesen wants to offer all his knowledge about regional development. He notices that knowledge exchange is not natural. ‘Get some, give some’ is a requirement. A negative of knowledge exchange that it requires a lot of time. Therefore, this process should be facilitated by making formats and other rules.

A knowledge management system should not result in a spam of knowledge requests. They don’t want to be contacted daily by people who like information and especially not from organizations outside the project Space for the River. The system should operate on demand. Of course they like to help others, but a first filter should limit that group. This filter includes a set of documents where these persons can find the information they seek.

Ruesen finds the project managers day essential and the main task of the PDR. He stipulates that the content of such a day is more what the project managers want; demand. Knowledge provided by the PDR is not neutral, but still includes Rijkswaterstaat aspects. He thinks that the PDR should ask the question: ‘how can we make ourselves unnecessary? What should we develop so that the projects can do it together without the PDR? That should be their challenge and will result in more imagining instead of making formats, responsibilities and forcing unwanted procedures towards local government. The PDR is not customer friendly. You should develop a answer and not designing it (see figure 32).

Ruesen like to receive a digital copy of my report. He thinks that it is useful to present my outcomes towards the project managers as much as possible in order to create a ‘we’ feeling. This can be done by e-mail.

![Figure 32: Designing or developing an idea](image-url)
Interview Luciën Koridon
10 July 2007, Nijmegen

Koridon is project manager of the project “dijkteruglegging Lent” in Nijmegen. The project used to be coordinated by RWS-Oost Nederland, but at the moment is done by the PDR. According to Koridon, the municipality of Nijmegen is doing a task for the PDR, because, at the moment, there is no contract (bestuursovereenkomst) with the PDR. The Stuurgroep is the only remaining platform of stakeholders in the project, which includes the municipality of Nijmegen, the province Gelderland, Waterboard Rivierenland, Stadsregio Arnhem-Nijmegen, the PDR and sometimes VROM. The project has passed SNIP2A and is currently designing a spatial plan.

Koridon has bilateral contact with the bureaucrats of the stakeholders in this project. In addition, he is going to organise atelier-meetings with some of them, as well as several meetings with the local organisations. During these meetings they exchange knowledge, which should improve communication and the spatial plan and increase support for the project. Especially contact with the people from Lent important, because they were against the chosen alternative. The project has no explicit knowledge goals, but tries to make connections with other projects in the area. In addition, the PDR provides knowledge during the bilateral meetings and by sending documents. Next to the project managers’ day, Koridon had contact (by phone) with the projects at Noordwaard, Zwolle and Deventer and recently the province of Gelderland for Veessen-Wapenveld, Zwolle, Devente and, Zutphen. He received information about what firms to hire and what problems others have and how they dealt with it. He states that there is no threshold to pick up the phone and call other project managers. In total, he recon to have spent just a couple of hours, because he doesn’t need it that much.

He is looking for the right connexion with the supervision of the PDR. And what makes this project different in comparison to other infrastructure or spatial projects? What specific knowledge do we need and should we use? He likes to know the role of the PDR in comparison to the projects. He thinks that the PDR should take the lead when it comes to subjects like polluted soil, nature compensation, procedures, natura2000 or approaching the market, etc, because Rijkswaterstaat has a lot of experiences with these subjects. In other words, he likes to receive knowledge about these subjects. Documents and bilateral meetings with people of the PDR should provide this knowledge. He stipulates that if knowledge-questions towards the PDR take too long to be answered, he will call other project managers instead. It is essential to minimize the time to provide the answer.

Koridon is willing to share his knowledge and experiences, but it should not take to much time (not whole days) and likes to see some benefits of doing it. What is in it for me? In addition, some knowledge or information is confidential and should be treated a like. The exchange of knowledge is most effective in small groups with a lot of discussion. The project managers’ day should therefore be more focussed on workshops and content-related discussion. Skip the general presentations and just send them by e-mail, because he has the feeling the only a few people actually hear something new. However, he compliments the people that gave presentations about their drive and enthusiasm. People should sign in for certain workshops and the PDR must combine those projects that have the same problem. That will be very effective, according to Koridon. He prefers the location central and easy to access like the Jaarbeurs in Utrecht, because otherwise it takes to much time. Additionally, be careful with organizing too many project managers days. If people have learned nothing after just two days, they will probably not come again.

For a knowledge-management system he prefers an overview of all projects and their status. What are they doing at the moment, which phase (not just SNIP2A but what subject) and what kind of
products? This should be kept up-to-date by the PDR, because he thinks that project managers will give this low priority. Maybe a kind of newsletter every 3 to 6 months for all project managers, which states what all projects are currently doing. He likes a rogues gallery (smoelenboek) and pictures and maps of the projects as well as important documents. This should be quickly accessible with help from a search engine. Koridon like to receive a digital copy of my research report.

Interview Pim Nijssen
29 Juli 2007, Deventer

Nijssen works for Tauw and is project manager of the project ‘Uiterwaardvergraving Bolwerksplas, Worp en Ossenwaard’ in Deventer. This project has multiple stakeholders: Municipality of Deventer and Voorst, Province Overijssel, Ministry V&W, LNV and VROM, Waterschap Veluwe and Groot Salland, Stichting IJssellandschap, Dienst Landelijk Gebied, Sallands Bureau voor Toerisme, Staatsbosbeheer, different watersport organizations and other local stakeholders. They are represented in the Stuurgroep and/or Ambtelijke Begeleidinggroep and/or Klankbordgroep. The involvement of all these stakeholders should result in great support, although it could easily lead to more bureaucracy.

The project team assumes to have more knowledge instead of more explicit knowledge in comparison to the other stakeholders. They are involved in all areas and know the process steps and procedures better. This knowledge and explicit knowledge of other stakeholders are exchanged during meetings of the stuurgroep, ABG and klankbordgroep by presentations and discussions. The ABG has a meeting 5 times a year and occasional email contact. The atmosphere is good. The stakeholders do not have a joint database, but documents are sent by mail or e-mail. Every 2 to 3 months, the project has a newsletter for everybody in the area. The project has no explicit knowledge goals.

The project learns a lot from the projects at Zwolle. The link is the province Overijssel and DLG, who are involved in Zwolle and Deventer. They learned about certain aspects of tendering, project strategy and hydraulics. This has a positive result for the planning. Next to receiving knowledge, they share knowledge with other projects by, for example, giving a presentation during the project managers day. Nijssen estimates that exchanging knowledge with other projects requires an hour a week next to the project managers day of the PDR and that of the IJssel.

Nijssen cannot indicate what kind of knowledge they can use of other projects. He thinks that the PDR is more capable of doing this. He stipulates that it is important to do things yourself and learn from it instead of listing to or reading from the knowledge of others. However, he has some troubles with risk management, procedures and other aspects of managing such a big and new project. He prefers knowledge exchange with others face-to-face through presentations and discussions. Nijssen is willing to exchange all his knowledge. However, without going into detail about sensitive - generally political - subjects or other perils. Already, he presented his ‘Ruimtelijke kwaliteitskader’ at the project managers day.

A precondition for knowledge exchange is that other stakeholder or project managers use it in confidence. They must not distribute it to parties that have nothing to do with it or that can do harm with it. Another precondition is that, when another uses specific knowledge, the source must be mentioned. A precondition for a knowledge management system is that it must be easy accessible. The programme or website must be easy to use and lead to the right information quickly. Therefore, a summary of 2 or 3 sentences for each document will indicate if the document is useful for the user.
Nijssen finds the project managers day very useful where people exchange knowledge by presentations and informal discussion. The atmosphere is good, but it was a long day. He liked the workshops. He thinks that is more interesting if the location is at one of the projects of Space for the River and with that, a small excursion through the project area. In addition, more time for informal contact.

Nijssen likes to receive a digital copy of my research report. He gives permission for mentioning his name in that report.

Interview Yolande van der Meulen
16 July 2007, Rotterdam

Van der Meulen works for Rijkswaterstaat and is project manager of project Noordwaard since March 2007. The project has many stakeholders like the municipality of Werkendam, waterboard Rivierenland, Province Noord-Brabant, LNV, PDR and many local organizations like staatsbosbeheer, inhabitants Bandijk, Hollandsche Waterlinie and environmental and recreation organizations. The stakeholders are divided in a Stuurgroep, Ambtelijke Begeleidings Groep (ABG) and Klankbordgroep (KBG). The project just finished SNIP2A and probably will finish SNIP3 and SNIP 4 summer 2008.

A consortium of engineering firms is doing most aspects of the project like the MER and the spatial design. This consortium has a database that is accessible through a website for all stakeholders in the ABG. This makes it possible to exchange information quickly and efficient. Additionally, 4 to 5 times a year, the ABG as well as the Stuurgroep and KBG have a meeting. The atmosphere during the meetings is good (again) and everybody cooperates and is willing to share knowledge. In between, the stakeholders correspond by e-mail or mail. Often, the local inhabitants receive a newsletter or mail and sometimes have the opportunity to speak the project team at the Biesbosch-museum or at special organized meetings.

Van der Meulen knows where to look for certain knowledge, but it is mainly the task of the consortium to gather all that knowledge and information. She has contact with many different divisions of Rijkswaterstaat or other projects in the Netherlands, where she exchange knowledge and learn many things, for example about setting up a project team according the Integrated Project Management model or participation of local inhabitants. Furthermore, the projects of Space for the River that are done by Rijkswaterstaat under supervision of Luuk Bosch have agreed to see each other every two weeks to exchange knowledge. Contact with other projects in Space for the River is limited to the project managers meeting day. Her predecessor had probably more contact, but she doesn’t know anything about that. Once, there was an idea to have a meeting with the project managers of Zwolle and Overdiep, but this never happened. Again, van der Meulen has mainly contact with people of Rijkswaterstaat and many like to do jobs for the project because it such an important and interesting project in the Netherlands. In total, van der Meulen estimates that she spends a day a week with exchanging knowledge with others.

Van der Meulen is also project manager of the project “Volkerak-Zoommeer”, which is a completely different project. However, she will use the same knowledge and approach as the project Noordwaard.

She likes to know from the PDR the boundaries and extend to which she is supposed to do her work. She has the feeling that the PDR is still struggling about what should be included in documents like SNIP2A. As ‘koploper’ it is almost if the project is further ahead than the PDR. Additionally, she likes
to receive more knowledge about innovation. The other way around, her project team can provide knowledge about subjects like, organizing a project team, managing real estate, participation with local inhabitants, tendering to the market, risk-management, archives management and control and maintenance management. This knowledge can be transferred by documentation, but preferably by personal contact like presentations. A precondition for exchanging knowledge is that it is treated confidential.

The project managers meeting day was good and at a nice location. It is primarily a network day, because it is a perfect opportunity to introduce certain stakeholders to each other or meet other projectmanager. For example, she invited an alderman to meet people from DG Water and PDR. Additionally, they gave a presentation about risk-management and are willing to do it again.

The knowledge management system should be user-friendly and up-to-date. Projectmanagers should be able to store important documents easily.

Van der Meulen likes to receive a digital version of my graduation report in October

Interview Hans van Amstel
10 July 2007, Utrecht

Van Amstel is projectmanager of the project ‘kribverlaging Waal’. This project has started in March 2007 and he is still composing his project team. The project includes the lowering of 750 groynes between Nijmegen and Gorichem and maybe additionally the groynes at the Pannerdensch Kanaal. The stakeholders in this project are Rijkswaterstaat Oost-Nederland, some municipalities and presumably the fishing organizations, Schuttevaer and VROM. The project will go straight towards SNIP 5. The province of Gelderland is working on an alternative project together with the University of Nijmegen; the Waal Weelde. This project includes extra waterways (nevengeulen) and lowering of the floodplains. In 2009, the State Secretary will decide if the project of van Amstel is switched to the project of province of Gelderland.

Van Amstel had contact with RWS-ON and with the Space for the River projects Noordwaard and Hondsbroekse Pleij. He received a quarterly report as an example. Contact with the RWS-projects under supervision of Luuk Bosch will be more structural in the near future. This should stimulate knowledge exchange between the RWS projects of Space for the River. At the moment, besides the RWS-projects, he had no contact with other projects of Space for the River.

Van Amstel prefers a common database for all RWS-projects. It is important to distinguish a database for RWS-projects and projects done by local government, because the RWS-projects have a different way of working. They have to follow an integrated project management model, whereas local government handles it their own way.

He likes to receive knowledge about the different procedures and permits that are needed. He likes to know about the consequence of the different laws (WVO, WBR, WMB, etc.) for his project. What should he do, how and how long is it going to take. In addition, he likes to know about the formats of the different documents. This knowledge could be added to the database. The database should start with general subjects and go into more detail when you click on it. The other way around, van Amstel has knowledge about innovative groynes and risk-management, which he is willing to share.

A precondition for an effective knowledge-management system is that 1) people want to search
for knowledge elsewhere and 2) people must be willing to share their knowledge. Additionally, the system should start simple according to the 80-20 principle. It is important that the system should not become too complex and slow. If the system works, additional modules could be attached. Keep it simple!

The projectmanagers day was very informative and provides an easy step to see what others are doing. He likes more time for interaction during the carrousels in order to learn even more from other projectmanagers. The location was inspiring and innovative.

Van Amstel likes to receive a digital copy of my research report.

Interview Iede Blok
27 July 2007, Arnhem

Blok is the projectmanager of the project “Dijkverlegging Hondsbroeksche Pleij” and works for the Directorate General for Public Works and Water Management (DGR). Originally, it was not a project of Space for the River, because it had started long before the Spatial Key Decision was finished in 2006. The project has finished the planning phase and acquired most permits. They have started with their constructional work in March 2007. The project has an Ambtelijke Begeleidings Groep (ABG) that includes representatives of DGR, Province Gelderland, Municipality Westervoort and the Waterboard Rijn and IJssel. The advisory board from the planning phase has become a Klankbord Groep (KBG), which includes local organizations. This way, they can communicate with the ABG in case of any trouble like noise pollution.

At the moment the ABG has meetings every 4 or 6 weeks. The representative of the Waterboard and the contractmanagement-team have contact weekly to inform the Waterboard about the actuel situation. This high frequency is choose to optimize the exchange of information between DGR and the Waterboard. This is necessary because, after the project is finished, the waterboard becomes responsible for maintaining the new dike. The ABG does not have a mutual database or extranet, but exchange documents by e-mail or regular mail. Most knowledge is exchanged between the organizations of the ABG during the meetings by means of presentations and discussions. The atmosphere is open during the meetings of the ABG, although, it happens, the municipality tries to gain extra facilities in the project like for example walking paths or other recreational facilities.

Blok did not have contact with other projects of Space for the River except during the projectmanagers meeting day. He thinks that other projects can not help him, because his projects is too far ahead in comparison to the other projects of Space for the River. Therefore, he gave and will give again, presentations about their experiences on the projectmanagers meeting day. However, there is internal policy within the DGR for projectmanagers of different DRG projects to communicate and exchange knowledge trough UPP, a kind of intranet with best practices of several documents or knowledge aspects.

Blok has a lot of experiences with this kind of projects and is willing to share that knowledge with other projectmanagers. He has knowledge about procedures, communication with local organizations and inhabitants, a seepage screen, international cooperation in river management and tendering. A precondition is that knowledge sharing with other projectmanagers will not endanger the progress of the Hondsbroeksche Pleij project. Due to the limited size of his project team, it is helpful if he acquires extra capacity to deal with sharing knowledge to others.

According to Blok, the location of the projectmanagers meeting day was awkward, but fun. He
argues that the type of location can affect the PDR’s image, as we work together with other lower government organisations. The agenda of the day, with general presentations and carrousels, was good.

A knowledge management system should not include too many documents that are not finished and have multiple versions. Keep it clean and only publish documents that are finished and, maybe, even signed. Try to distinguish the best practices. Additionally, exchange the rules and procedures like SNIP that are common to people of the DGR, but not to people of other local government organisations.

Blok likes to receive a digital version of my report in October.

**Interview Hans Luiten**

9 July 2007, Den Haag

Luiten is head of the knowledge management unit at the PDR. This unit checks the documents of the initiators and reports to DWW on the one hand and facilitates the initiators with knowledge on the other hand. They don’t cover all expertise and sometimes have to search for knowledge at other units of Rijkswaterstaat and even at companies outside Rijkswaterstaat.

Facilitating the projects of Space for the River happens only on request. Project-managers have to mail or phone an explicit knowledge-question. The knowledge management unit does not mingle with the project in order to hold back any responsibility what so ever. The local governments have to do it themselves, which implies that the knowledge management unit will present the formula, but will not calculate the outcome. They often facilitate or exchange knowledge face-to-face but sometimes by documents.

Luiten wants especially contact with the initiators in the beginning to help them on their way. However, they will not force themselves to the initiators. During the planning phase, regular contact is beneficial for an adequate check. All together, the unit knows all project-managers and has all there contact information. Especially the Q-team has a lot of contact with all projects.

The knowledge management unit likes to receive certain knowledge about soil, archeology, cables and wires from the projects. They like this information to be up to date and how they have come to their conclusions. If they don’t trust the analysis, they like to see calculations as well. There is also fine-tuning with the unit Project Control, which results in intensive contact.

The unit is willing to exchange all the knowledge they posses except business sensitive information like prices, because that will make the PDR weak as controller of tenders.

Knowledge can be exchanged by a website, documents, projectmanager-days and maybe a symposium. Important is that people present their ideas not as the truth. It must be clear to the people what the facts are and what the opinions are. This should be checked and controlled to prevent uncertainty. Also, the knowledge management system should be complete. Everybody should be able to find what he is looking for. For more knowledge, I could add links to other websites with more detailed knowledge. A last remark, it is very effective if all documents or posts on a forum are accompanied by a photo and contact information. This helps the users to contact each other.

Luiten likes to receive a digital copy of my research report.
Interview Regina Collignon
9 July 2007, Den Haag

Collignon facilitates the Q-team of the PDR. The Q-team is an independent jury that gives advice about the spatial quality of a project in Space for the River. The Q-team includes the national adviser for landscape (Rijksadviseur van het Landschap), an ecologist, a urban developer, a river-expert and a physical-geographer, most from external companies in order to safeguard the independency of the team. The Q-team visits every two weeks a different project where they give a presentation about their ideas to the project-team and vice versa. After the lunch, they will have a fieldtrip and afterwards formulate an advice, which is presented to the Ambtelijke Bestuurs Groep. This advice is signed by national adviser for landscape and goes to the PDR. According to Collignon, most of the time (90%) the advice is used and finds it way in the decision-making process. Sometimes there is a disagreement or obscurity among the projectmanagers. Collignon or the riviertakmanager will try to facilitate the process between the projectmanager, PDR and Q-team to come to consensus. It is all about working together and having a good decision-making process.

The advice includes next to landscape recommendations also process recommendations such as the composition of the project-team. Are all expertise included in the project-team to cover all the aspects of such a project? And is there tuning with other projects in the area?

The Q-team tries to visit each project three times during the planning phase: in the beginning, before SNIP2A and somewhere between SNIP2A and SNIP3. This has not been the case for the Koplopers like Scheller and Oldeneler Buitenwaarden at Zwolle. The Q-team is set-up October 2006 and by then this project was already on their way. Before SNIP2A, the Q-team gave their first advice. This included the introduction of a ‘hank’, a characteristically aspect of the river IJssel. Especially this caused disappointment and mistrust from the local people in the Klankbordgroep. Collignon states that dealing with the local stakeholders is the project manager’s responsibility.

Collignon and her colleagues have a lot of knowledge about the PKB. They posses knowledge about the ‘regionaal ruimtelijk kader’, the ‘vogelhabitat richtlijn’ and ‘handreiking IJssel’. They are willing to share this, but like to see what happens with their knowledge. In return, she likes to receive all maps, drawings and sketches of all projects in order to give the Q-team better information to work with. At this moment, knowledge sharing goes mainly through the Riviertakmanagers.

Most knowledge questions require custom made solutions or answers because the problem is often very specific for a certain area and in a certain political context. According to Collignon, it is difficult to solve these problems with a knowledge management system. Additionally, at the moment, she receives almost no knowledge questions, but it is increasing. It seems difficult for the projectmanagers to find their way to the knowledge management Unit of the PDR.

Knowledge sharing should not take too much time and the system should be user-friendly and especially should include contact information about the people.

Collignon likes to receive a digital copy of my research report.

Interview Steef Severijn
10 July 2007, Den Haag
Severijn works at the planning & control unit of the PDR. The primary task of this unit is to monitor the projects of Space for the River if they are doing well on the subjects budget, planning, scope and risks. The monitoring happens by means of quarterly reports, where the projectmanagers have to describe the current status on all these subjects. Their second task is to facilitate the projects with their knowledge and instruments according to budget, planning, risk-management and real estate. They have meetings where knowledge is exchanged by interaction and presentations. A private party facilitates risk-management: Twynstra & Gudde.

Severijn noticed that projects have difficulties with organizing a good project-team and properly managing their project. Severijn facilitates them by having meetings and discuss the planning, Plan van Aanpak and real estate. Especially, during the negotiating of the contracts (bestuursovereenkomsten), Severijn had a lot of contact with the projectmanagers. This helped him to estimate the capabilities of every projectmanager and could indicate if they needed help or not. Most of the contracts include agreements how the projects have to deliver information towards the unit planning & control.

Planning & control likes to know on short notice when things are going wrong at a project. This implies transparency and accurate information from the projects towards the P&C-unit. Already, the projects have to provide more information for better monitoring. In the beginning, some projects resisted but have gradually cooperated and benefited. The P&C-unit has established formats how information should be delivered.

Severijn has a lot of knowledge about project management and planning & control. For the subject real estate he is the account manager and knows the rules and the possibilities within the projects. Each project has to design an acquisition strategy. A pre-condition for knowledge sharing is trust, essential as well for a partnership. If there is trust, projectmanagers will report sooner when things are going wrong. According to Severijn, there should be more cooperation with the project, but there is little time for doing that. Another precondition for knowledge sharing is that confidential information is treated as such by others.

For a website/database, Severijn likes a map where all projects are shown and acts like a homepage. If you click on a project it should indicate all the subjects that they are currently doing, preferable together with maps and tables. This makes it easier for the P&C-unit to see what is going on.

Severijn likes to receive a digital copy of my research report.
Appendix D: analysis evaluation
This appendix is a kind of summary of the interviews in the previous appendix. It discusses all the design principles for an effective knowledge management system. First the design principles on project-level is presented and secondly the design principles on programme-level.

Knowledge management on Project-level

<table>
<thead>
<tr>
<th>Design principles on project-level</th>
<th>Scheller and Oldeneler Buitenwaarden</th>
<th>Project Vianen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Status</strong></td>
<td>-Towards SNIP3</td>
<td>-Towards Plan van Aanpak</td>
</tr>
<tr>
<td></td>
<td>-Has ABG and KBG</td>
<td>-Has ABG, not yet KBG</td>
</tr>
<tr>
<td></td>
<td>-Initiator: Municipality Zwolle</td>
<td>-Initiator: Province Utrecht</td>
</tr>
<tr>
<td><strong>The stakeholders of the ABG and KBG have face-to-face communication</strong></td>
<td>-ABG has meetings 6 times a year</td>
<td>-The ABG has meetings +/- 2 times a month</td>
</tr>
<tr>
<td></td>
<td>-Fieldtrip in the beginning</td>
<td>-Fieldtrip in the beginning</td>
</tr>
<tr>
<td></td>
<td>-E-mail</td>
<td>- E-mail</td>
</tr>
<tr>
<td></td>
<td>-KBG has meetings 3 times a year</td>
<td></td>
</tr>
<tr>
<td><strong>Projectmanagement has explicit knowledge management goals</strong></td>
<td>Yes, Projectmanagement identifies the information needs of other stakeholders</td>
<td>No</td>
</tr>
<tr>
<td><strong>Stakeholders of the ABG and KBG are rewarded for knowledge sharing</strong></td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td><strong>The stakeholders know the appropriate contacts of other stakeholders</strong></td>
<td>Yes, all members of the ABG or KBG know each other.</td>
<td>Yes, everybody knows each other</td>
</tr>
<tr>
<td><strong>The stakeholders know each other’s core values and interests</strong></td>
<td>Yes, but some didn’t know the CV of KBG members</td>
<td>Pretty good, although Vianen didn’t know the CV of Nieuwegein</td>
</tr>
<tr>
<td><strong>The stakeholders have a common database</strong></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>The project has a public website</strong></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>The stakeholders encounter no problems finding knowledge at other stakeholders</strong></td>
<td>-ABG members have no difficulties -KBG members have difficulties acquiring knowledge form ABG. There is a knowledge gap between ABG and KBG</td>
<td>No, nobody had difficulties</td>
</tr>
<tr>
<td><strong>During meetings there is an open atmosphere of knowledge sharing</strong></td>
<td>-The ABG meeting is open, but some find it too informative. -The KBG meeting was hostile, but has changed in cooperative</td>
<td>-Yes, its open although some have little input</td>
</tr>
</tbody>
</table>
### Design principles on project-level

<table>
<thead>
<tr>
<th>Project Status</th>
<th>Bypass Veessen-Wapenveld</th>
<th>Floodplain adjustment ‘De worp’</th>
<th>Dike relocation Cortenoever and Voorster Klei</th>
<th>Dike relocation Lent</th>
</tr>
</thead>
</table>
| - Towards contract  
  - Has ABG, not yet KBG  
  - Initiator: Province Gelderland | - Towards SNIP2A  
  - Has ABG and KBG  
  - Initiator: Municipality Deventer | - Towards SNIP2A  
  - Has ABG, KBG unknown  
  - Initiator: Waterschap Veluwe | - No contract, towards SNIP3  
  - Only Stuurgroep  
  - Initiator: Municipality Nijmegen |

#### The stakeholders of the ABG and KBG have face-to-face communication

- The ABG had some meetings, but will be from August on every month  
  - ABG has meetings 5 times a year  
  - E-mail  
  - KBG has meetings  
  - Newsletter every 2 or 3 months for local people  
  - ABG has a meeting very month  
  - Fieldtrip in the beginning  
  - Work often together in the same building  
  - Also a Field-office  
  - ABG meeting in Deventer  
  - Atelier-meetings  
  - Contact with local organizations and people  
  - Bureaucrats of stakeholders have bilateral meetings  
  - Contact with local organizations and people

#### Projectmanagement has explicit knowledge management goals

- Yes, they want to learn as much as possible from other projects, which could use 50% of their time  
  - No  
  - No  
  - No, but tries to make connections with other projects in the area

#### The stakeholders have a common database

- No, not at the moment  
  - No  
  - Yes, the project team includes members of different stakeholders, which have an intranet  
  - No

#### The project has a public website

- They have a website together with other measures  
  - No  
  - Yes  
  - Yes

#### During meetings there is an open atmosphere of knowledge sharing

- The meetings with local organizations were difficult, because they are against the project  
  - The ABG meeting has a good atmosphere  
  - The ABG meeting has a good atmosphere  
  - -
<table>
<thead>
<tr>
<th>Design principles on project-level</th>
<th>Depoldering Noordwaard</th>
<th>Adjustments Groynes in the Waal</th>
<th>Floodplain adjustment Munniken-land</th>
<th>Dike relocation Honds-broekse Pleij</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project status</strong></td>
<td>-Towards SNIP3</td>
<td>-Just starting, no contract</td>
<td>-Towards SNIP2A</td>
<td>-Implementation phase</td>
</tr>
<tr>
<td></td>
<td>-ABG and KBG</td>
<td>-No ABG and KBG</td>
<td>-Has ABG and KBG</td>
<td>-ABG and KBG</td>
</tr>
<tr>
<td><strong>The stakeholders of the ABG and KBG have face-to-face communication</strong></td>
<td>-ABG and KBG have meetings 4 to 5 times a year</td>
<td>There has been some contact with some stakeholders</td>
<td>-ABG has meetings +/- 9 times a year</td>
<td>-ABG has meetings every 4 to 6 weeks</td>
</tr>
<tr>
<td></td>
<td>-E-mail</td>
<td></td>
<td>-Outside the meetings no contact, sometimes an up-to-date mail of</td>
<td>-E-mail</td>
</tr>
<tr>
<td></td>
<td>-Newsletter for local people whenever there is news</td>
<td></td>
<td></td>
<td>-KBG has meeting (frequency unknown)</td>
</tr>
<tr>
<td></td>
<td>-Field Office</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Project management has explicit knowledge management goals</strong></td>
<td>Yes, the consortium is obligated to share information</td>
<td>Yes, a relevant study is done by Province Gelderland and University Nijmegen.</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>The stakeholders have a common database</strong></td>
<td>Yes, the consortium has a database accessible for all ABG members</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>The project has a public website</strong></td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>During meetings there is an open atmosphere of knowledge sharing</strong></td>
<td>-The ABG meeting has a good atmosphere again, after some troubles</td>
<td>-</td>
<td>-Yes, its open and everybody shares knowledge</td>
<td>-The ABG meeting has a good atmosphere although some stakeholders always try to gain something</td>
</tr>
</tbody>
</table>
## Knowledge management on Programme-level

<table>
<thead>
<tr>
<th>Design principles on programme-level</th>
<th>Scheller and Oldeneler Buiten Waarden</th>
<th>Vianen</th>
<th>Floodplain adjustment Munniken-land</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The project managers have face-to-face communication</strong></td>
<td>Contact with other projects, including Vianen, Overdiepsche Polder and Deventer. Not only PM, but also other stakeholders have contact with stakeholders of other projects</td>
<td>Contact with Overdiepsche Polder on regular basis and requested information from the projects at Zwolle and Deventer.</td>
<td>Contact with some other projects by phone requesting some documents</td>
</tr>
<tr>
<td><strong>Time reduction from sharing knowledge with other projects</strong></td>
<td>Yes, they acquired knowledge from Overdiepsche Polder, which resulted in a more structured discussion.</td>
<td>Yes, it helped to make certain decisions, which saved time and had a positive influence on the planning.</td>
<td>Yes, but could be more if they had more contact</td>
</tr>
<tr>
<td><strong>Exchange of knowledge has resulted in new and innovative solutions</strong></td>
<td>No</td>
<td>No</td>
<td>Yes, the documents with information resulted in new insights.</td>
</tr>
<tr>
<td><strong>Difficulties of acquiring knowledge from other project managers or PDR</strong></td>
<td>Not with other project managers, but with PDR. Uncertainty about criteria, documents and other knowledge subjects.</td>
<td>Not with other project managers</td>
<td>Not with other project managers</td>
</tr>
<tr>
<td><strong>Design principles on programme-level</strong></td>
<td><strong>Dike relocation Cortenoever and Voorster Klei</strong></td>
<td><strong>Bypass Veessen-Wapenveld</strong></td>
<td><strong>Floodplain adjustment ‘De worp’</strong></td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-----------------------------------------------</td>
<td>-------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td><strong>The project managers have face-to-face communication</strong></td>
<td>Contact with other projects, including Munnikenland and the projects at Deventer. Additionally, the waterboard is stakeholder in other projects.</td>
<td>Not yet, but they will contact many other projects in order to learn quickly and to finish the project in time</td>
<td>Yes, especially with the other project at Deventer and the projects at Zwolle, because some organizations are stakeholders in multiple projects</td>
</tr>
<tr>
<td><strong>Time reduction from sharing knowledge with other projects</strong></td>
<td>Yes, the received documents helped as example, which saved time and money</td>
<td>Not yet, but it is their goal to save time by using knowledge of other projects</td>
<td>Yes, certain knowledge improved the planning</td>
</tr>
<tr>
<td><strong>Exchange of knowledge has resulted in new and innovative solutions</strong></td>
<td>Yes, better quality of designs and products. It made it possible to fine-tune their products</td>
<td>No (not yet)</td>
<td>No</td>
</tr>
<tr>
<td><strong>Project managers have difficulties of acquiring knowledge from other project managers or PDR</strong></td>
<td>Not with other project managers</td>
<td>Not with other project managers, but contact with the PDR is dramatic and is frustrating. The PM does not know whom to contact at the PDR</td>
<td>Not with other project managers</td>
</tr>
<tr>
<td>Design principles on programme-level</td>
<td>Dike relocation Lent</td>
<td>Depoldering Noordwaard</td>
<td>Adjustments Groynes in the Waal</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>---------------------</td>
<td>-------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td><strong>The projectmanagers have face-to-face communication</strong></td>
<td>Contact with other projects, including Noordwaard and the projects at Zwolle and Deventer.</td>
<td>Contact with other projects done by the DGR, but almost none with the other projects. There was an idea to have a meeting with Overdiep and Zwolle, but it never happened.</td>
<td>Contact with other projects done by the DGR</td>
</tr>
<tr>
<td><strong>Time reduction from sharing knowledge with other projects</strong></td>
<td>No</td>
<td>Unknown, because the former PM is gone.</td>
<td>Not yet</td>
</tr>
<tr>
<td><strong>Exchange of knowledge has resulted in new and innovative solutions</strong></td>
<td>No</td>
<td>No, because they have almost finished their planning phase</td>
<td>No</td>
</tr>
<tr>
<td><strong>Projectmanagers have difficulties of acquiring knowledge from other projectmanagers or PDR</strong></td>
<td>Not with other projectmanagers, but has trouble with the role of the PDR.</td>
<td>Not with other projectmanagers or the PDR</td>
<td>Not with other projectmanagers or the PDR</td>
</tr>
</tbody>
</table>
Appendix E: results evaluation

This appendix shows the results of the case studies as well as the interviews with the different stakeholders, project manager, and people at the PDR.

Results design principles project-level

<table>
<thead>
<tr>
<th>Design principles on project-level</th>
<th>Scheller en Oldeneler BW</th>
<th>Vianen</th>
<th>Veessen-Wapenveld</th>
<th>De Worp</th>
<th>Cortenoever, Voorster Klei</th>
<th>Lent</th>
<th>Noordoostpolder</th>
<th>Kribverlaging</th>
<th>Munnikenland</th>
<th>Hondbroeksche Pleij</th>
</tr>
</thead>
<tbody>
<tr>
<td>The stakeholders of the ABG and KBG have face-to-face communication</td>
<td>+</td>
<td>+</td>
<td>n/a</td>
<td>+</td>
<td>n/a</td>
<td>+</td>
<td>n/a</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Project management has explicit knowledge management goals</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Stakeholders of the ABG and KBG are rewarded for knowledge sharing</td>
<td>?</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The stakeholders know the appropriate contacts of other stakeholders</td>
<td>+</td>
<td>+</td>
<td>U</td>
<td>n</td>
<td>k</td>
<td>n</td>
<td>o</td>
<td>w</td>
<td>n</td>
<td></td>
</tr>
<tr>
<td>The stakeholders know each other’s core values and interests</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The stakeholders have a common database</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>The project has a public website</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>The stakeholders encounter no problems finding knowledge at other stakeholders</td>
<td>-</td>
<td>+</td>
<td>U</td>
<td>n</td>
<td>k</td>
<td>n</td>
<td>o</td>
<td>w</td>
<td>n</td>
<td></td>
</tr>
<tr>
<td>During meetings there is an open atmosphere of knowledge sharing</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>?</td>
<td>+</td>
<td>?</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
### Results design principles programme-level

<table>
<thead>
<tr>
<th>Design principles on programme-level</th>
<th>Scheller en Oldemeler Bw</th>
<th>Vianen</th>
<th>Veessen-Wapenveld</th>
<th>De Worp</th>
<th>Cortenoever, Voorster Klei</th>
<th>Lent</th>
<th>Noordwaard</th>
<th>Kreibverlag</th>
<th>Munnikenland</th>
<th>Hondbroeksche Pleij</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasks are established to identify the information resources necessary for the organizations</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>The project managers have face-to-face communication</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>The PDR informs of and reward collaborators’ achievements</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>There are incentives when the overall aims of the programme Space for the River are achieved</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Project managers and PDR have a common database (extranet)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Best practices in one project are shared with other project managers</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>There is a system to codify explicit knowledge</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Project managers have difficulties of acquiring knowledge from other project managers or PDR</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
Appendix F: knowledge subjects

This appendix indicates the different subjects that the project managers like to receive in order to enrich their own project. This information comes directly from the interviews.

Knowledge that project managers like to receive:

- Financial planning
- Risk management
- Planning
- Environmental issues
- Market & Tendering
- Laws and changes in laws
- Permit procedures
- Progress reports
- Spatial Quality Framework
- Natura2000, nature compensation
- Polluted Soil

Knowledge that project managers want to share:

- Process management
- Public participation
- Fauna & Flora and nature maintenance
- Recreation (and the combination with nature development)
- Dealing with ‘omwissel besluit’
- Setting up a project-organization
- Purchasing of land
- Hydraulics
- Damage claims
- Permits procedures
- International cooperation in river management
Appendix G: basis of design

Institutional requirements
- Project managers should post documents within a day if it becomes official
- The PDR should distribute a newsletter every quarter about the status of each project
- There should be a good balance between receiving knowledge and providing knowledge
- The PDR should stimulate knowledge exchange financially (FTE)
- Success stories should be published. People like to see what happens with their knowledge
- The system should be for project managers only

Institutional constraints
- One must publish the source when it uses knowledge of someone else
- Knowledge or information must be treated confidential and should not come in the hands of private parties that take disadvantage with it
- Participation must not be obligated, but also not free of obligation
- Knowledge questions must be answered quickly
- Users must not call daily for asking knowledge questions
- The system must be for Space for the River people only
- The system must not become an advertisement website for DGR services, consultancy firms or engineering firms

Technical requirements
- The lay-out extranet should be according to subject and project-phase
- All documents or messages on the forum should come with a name, contact information and photo of that person
- The extranet must have rogues gallery
- The extranet must have a forum for knowledge questions
- Not only official documents should be included. Concept-versions contain a lot of information as well
- Documents should be delivered according to a certain format
- The extranet should include pictures and maps of each project
- There should be a separate database for the DGR-projects
- There should be obvious distinction between facts and opinions

Technical constraints
- Documents must include a summary of 2 or 3 sentences
- The extranet must be up-to-date
- There must be a search-machine
- Users must not publish judgments about (bad) experiences with companies
- The extranet must contain links to other extranets with specific knowledge
- The extranet must have a map that displays all projects and what they are doing

Process requirements
- ---

Process constraints
- The system must start simple and extended if desired
### Kennisonderwerp

<table>
<thead>
<tr>
<th>Kennisonderwerp</th>
<th>Project fase</th>
<th>Projecten</th>
</tr>
</thead>
<tbody>
<tr>
<td>Markt &amp; Aanbesteding</td>
<td>Bestuursovereenkomst</td>
<td></td>
</tr>
<tr>
<td>Wetten &amp; Procedures</td>
<td>Plan van Aanpak</td>
<td>SNIP2A</td>
</tr>
<tr>
<td>Klankbordgroep</td>
<td></td>
<td>SNIP3</td>
</tr>
<tr>
<td>Flora &amp; Fauna</td>
<td></td>
<td>SNIP4</td>
</tr>
<tr>
<td>Ruimtelijke kwaliteit</td>
<td></td>
<td>SNIP5</td>
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<tr>
<td>Techniek</td>
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<td>SNIP6</td>
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<tr>
<td>Project Beheersing</td>
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</tr>
<tr>
<td><em>Voeg document toe</em></td>
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<td></td>
</tr>
</tbody>
</table>

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### Profiel

**Naam:** Hans Visser  
**Project:** Noordwaard  
**Functie:** Projectleider  
**Email:** Hans.visser@noordwaard.nl  
**Telefoonnummer:** 06-1000000

**Fase project:** SNIP2A  
**Laatste keer extranet bezocht:** 2-11-07

- [Edit Profiel (klik hier)](javascript:alert('Edit Profiel'))  
- [Overzicht van alle profielen (klik hier)](javascript:alert('Overzicht van alle profielen'))

---

### Prikbord

De volgende Projectlidersdag is op 11 September  
(post op 19 Juli 2007)  
Er is een nieuw kennisonderwerp bij: Flora & Fauna  
(post op 19 Juli 2007)  
Het project Vrijlen heeft een nieuwe projectmanager (post op 12 Juli 2007)

---

### Forum kennisvragen

<table>
<thead>
<tr>
<th>Vraag</th>
<th>Datum</th>
<th>Wie?</th>
<th>Mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wie heeft er een voorbeeld van een onteigeningsaanvraag?</td>
<td>19 Juli</td>
<td>Hans Visser</td>
<td>Mail</td>
</tr>
<tr>
<td>Wat zijn de mogelijkheden omtrent natuurcompensatie?</td>
<td>17 Juli</td>
<td>Karel Plaskerk</td>
<td>Mail</td>
</tr>
<tr>
<td>Waar moet ik rekening mee houden als het Q-team langs komt?</td>
<td>16 Juli</td>
<td>Pietje Puk</td>
<td>Mail</td>
</tr>
<tr>
<td>15 Juli</td>
<td>15 Juli</td>
<td>15 Juli</td>
<td>Mail</td>
</tr>
</tbody>
</table>

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Appendix I: Scientific article

Evaluating interorganizational knowledge management in water policy making

Wytse H. Dassen

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Final paper to graduation Committee, 2 November 2007

Abstract

Effective knowledge management in or between organizations can increase the quality of public administration or increase profit. In order to estimate if knowledge management is effective, the scientific literature provides no workable framework. This article discusses a new approach to estimate the effectiveness of knowledge management. Instead of using the direct outcomes of knowledge management (e.g. innovation, etc) as performance indicators, that are impossible to measure, the focus is on the design principles that need to be addressed properly to have an effective knowledge management system. The design principles are determined by the context and its characteristics. This article uses an interorganizational setting of public organizations in water policy-making as a case study. The context of the case study ‘programme Space for the River’, Netherlands, has been characterized as a Community of Practice (CoP). With the literature about CoP’s, several design principles have been identified. The results of the case study could be used to improve the knowledge management system.

Key words: Knowledge Management, Evaluation, Community of Practice, Space for the River

1. Introduction

Almost every article on knowledge management starts with stipulating the importance of knowledge management for organizations (See: Marquès & Simon, 2006; Tseng, 2008; Chua & Lam, 2005; Riege 2007; Wastell 2001). For private firms, knowledge management is essential in order to gain a competitive advantage (Holsapple & Joshi, 2002; Cong & Pandya, 2003). For public organizations, on the other hand, knowledge management is needed to implement ‘the most effective approaches and to ascertain that society as a whole is served appropriately’ (Wigg, 2002: 228). In other words, effective knowledge management can increase the capability of the public administration in order to make complex, and often irreversible, design decisions quicker and more accurately (Wiig, 2002; Quintas, 1999; Tiwana, 2003). Furthermore, effective knowledge management limits the expenses of trial and error, reduces project time, stimulates innovation and can prevent expertise localization (De Bruijn & De Neree Tot Babberich, 2000; CIO Council, 2001; Love et al., 2003; Tiwana, 2003). Another result of effective knowledge management is the fact that it captures, shares and leverages knowledge before it leaves the organization. This is needed in the public administration in the Netherlands, because a large part of the workforce will leave in the next 10 years due to retirement (Liebowitz, 2005; Vergrijzingsmonitor 2007). According to Cong & Pandya (2003), knowledge management in public organizations has not the attention of managers it should have considering the many benefits. Fortunately, knowledge management in the public administration is stimulated by the need to drive efficiency across all public services, to improve the overall performance of public administration, to improve accountability and to migrate risk by making informed decisions, to resolve issues faster and to deliver better and more cost-effective services (Riege & Lindsay, 2006).

The implementation of an effective knowledge management system seems to be difficult. Charles Lucier, the first chief knowledge officer of Booz-Allen and Hamilton, proposed that 84 percent of knowledge management programmes exerted no significant impact on the adopting organizations and are abandoned within two or three years (Lucier & Torsiliera, 1997). The fact that many organizations struggle with managing knowledge effectively has made it an interesting subject that has been studied elaborately (Wastell, 2001).
One controversial issue is the (in-)ability to estimate its results. Recent years, many researchers have tried to find a method in order to estimate the contribution of knowledge management (Tseng, 2008). Still, there are little if any measures in the literature to measure the sharing of knowledge (Atkinson, 2006). Another notion is that most researchers focus on private firms, which are mostly related to profit. Little has been written about estimating the effect of knowledge management in public administration.

Criteria to estimate the effect of knowledge management in public administration are different for the private sector, because it has shareholders instead of stakeholders (Cong & Pandya, 2003). Shareholders want profit, whereas stakeholders can have different and even contradicting goals. Therefore, public administration has to deal with non-financial criteria most of the time, although some scholars have recognized the importance of non-financial criteria in private firms as well (Fahey & Prusak, 1998; Robinson et al, 2005).

This article will discuss the difficulties of estimating the effect of knowledge management in public administration. It will use the programme Space for the River, a large river management project in the Netherlands, as an example. Within this programme, 41 measures organized in projects are executed and implemented by different authorities (national, regional and local). Effective knowledge management can facilitate the sharing of knowledge between the different public organizations and increase the quality of the programme and is seen as crucial to the success of the programme. But, when is such knowledge management effective? How do we estimate this?

The article starts by explaining the general aspects of knowledge management focussing on public organizations. Furthermore, the difficulties of evaluating knowledge management will be addressed. The author will present and illustrate a new approach towards measuring the effectiveness of a knowledge management system.

2. Knowledge management in public organizations

An important aspect of knowledge management is the term knowledge itself. Often, knowledge is confused with data or information. According to Blumentritt and Johnston (1999), knowledge is built from data, which is first processed into information. Information becomes knowledge when it enters the system and when it is validated (collectively or individually) as a valid, relevant and useful piece of knowledge to implement in the system. They make a clear distinction between information and knowledge by posing that knowledge can only exist within the mind of the individual. However, Nonaka (1991) states that some knowledge is or can become explicit. His notion of explicit and tacit knowledge is widely supported (Davenport and Prusak, 1998; De Bruijn & De Née Tot Babberich, 2000; Tiwana, 2003).

Explicit knowledge is knowledge that can be captured, codified, written down and has a high degree of accuracy. It can be easily communicated and shared due to its formal and systematic language. It can be captured in documents, databases, patents, instruction manuals, written procedures, best practices, lessons learned, research findings, webs, emails and charts (Nonaka 1991; CIO Council, 2001; Tiwana, 2003).

Tacit knowledge, on the other hand, is personal, context specific knowledge that is difficult to formalise, record or articulate and is mainly developed through a process of trial and error encountered in practice (Tiwana, 2003). The employees in the organization are the carriers of tacit knowledge; it is stored in their heads as Tiwana (2003) names it. Tacit knowledge can only be disseminated to other employees by either making it explicit or by social interaction among personnel. This knowledge sharing is defined by Helmstadter (2003: 11) in terms of “voluntary interactions between human actors through a framework of shared institutions, including law, ethical norms, behavioural regularities, customs and so on, the subject matter of the interactions between the participating actors is knowledge”.

Next to these two forms of knowledge, the literature provides many definitions of knowledge management. Most scholars use the knowledge creation model (SECI) of Nonaka and Takeuchi (1995) as a basic framework for understanding the creation of knowledge. This model includes the sharing of tacit knowledge by means of personal communication or shared experiences (Socialization), the transformation of tacit knowledge into explicit knowledge (Externalisation), the combination of several knowledge aspects (Combination), which results in new tacit knowledge (Internalisation). In general, most definitions, either based on the SECI-model or not, state that knowledge management is a continuous process of creation (or generation), sharing (or
dissemination) and exploitation (or utilization or leveraging) of knowledge in a systematic way within an organization and outwards towards stakeholders (Bots & de Bruijn, 2002; Liebowitz, 2005; Cong & Pandya, 2003; Davenport & Prusak, 1998).

The above definitions of knowledge, forms of knowledge and knowledge management provide a first understanding of the subject knowledge management in general. For this article, it is essential to indicate clear differences between knowledge management in private and public organizations, because it helps to find the appropriate criteria to estimate the effectiveness of knowledge management. One difference was the kind of results of knowledge management: financial versus non-financial. Another difference is the type of knowledge that is created, shared and exploited. Van Geenhuizen & Nijkamp (1998) provide three types of knowledge, i.e. technical knowledge, management knowledge and commercial knowledge. Technical knowledge includes knowledge of specialized fields like hydraulics, spatial quality, law, finance, etc. Management knowledge includes controlling and steering of people and processes. Commercial knowledge is related to markets and finance. Although technical and management knowledge have more or less the same notion for private and public organizations, commercial knowledge is assumed to have a different meaning for both kinds of organizations. Commercial knowledge in private firms includes knowledge of the market that is used to gain a more competitive advantage. In public organizations it includes knowledge about local geographical and political aspects. To stipulate the differences, ‘commercial knowledge’ is replaced by the term ‘local knowledge’ (see figure 1). Often, the source for local knowledge is citizens, which makes public participation in policy making important. Technical and management knowledge can come from other organizations (public or private).

![Fig. 1. Types of knowledge](image)

Effective knowledge management will support organizations to collect, manage and integrate these different types of knowledge effectively and systematically. According to Cong & Pandya (2003: p30), a knowledge management framework has three elements: “the people and organisational culture to stimulate and nurture the sharing and use of knowledge; the processes or methods to locate, create, capture and share knowledge; and the technology to store and make knowledge accessible and to allow people to work together without being together”. The author of this article names this framework the ‘knowledge management system’. Consequently, the three elements are the building blocks of a knowledge management system (Riege, 2007). The content of each element depends on the characteristics of the context.

### 3. Evaluating framework for knowledge management

Hiebeler (1996) indicates that no other knowledge management area is as underestimated as estimating the effects of knowledge management, especially in public administration. This notion is supported by the fact that although for the private sector some methods have been developed (Tseng, 2008; Lee et al., 2005; Marqués & Simón, 2006), relatively few make an explicit connection between knowledge management measures and knowledge management performance (Kalling, 2003). For public organizations, the scientific literature provides practically no evaluation framework. Therefore, this section will describe a (new) framework that can be used to estimate the effectiveness of knowledge management in public administration.

The first step in the search for an evaluation framework is to use the direct results of knowledge management,
like more innovations, lower costs and improved quality. The direct results can be transformed into performance indicators. The scores on the different performance indicators together with norms determine the effectiveness of a knowledge management system. However, the use of performance indicators for knowledge management would not work. Firstly, because the results of a knowledge management system are influenced by many other factors like organizational structures, responsibilities, capacities, civil servant personal expertise and otherwise available intellectual capital (Wiig, 2002) (see figure 2). Secondly, the quality of a project, like the programme Space for the River, is determined among others by the different interests of the stakeholders, which results in many performance indicators. This makes it complex and a lot of work to estimate all the scores. Thirdly projects, like the programme Space for the River, are often unique and difficult to benchmark. In other words, it is almost impossible to indicate how much longer the execution of a project without knowledge management lasts or what the gains and costs would have been if the project had profited from some form of explicit knowledge management.

And even more, suppose that it is possible to measure the direct outcomes of knowledge management, what norms should be used to indicate the level of effectiveness? The scientific literature provides little if any norms, especially not for public organizations (Riege, 2007). This lack of norms plus the inability to use the direct results as performance indicators for knowledge management requires a different approach to estimate the effectiveness of knowledge management.

Fig. 2. Factors that influence success of a project or organization

2.1 New approach

As stated before, a knowledge management system consists out of three elements: people, process and technology. For a knowledge management system to be effective, these elements should be addressed properly. Since it is impossible to measure the results of a knowledge management system, it is helpful to look to the conditions for an effective system. The design of a knowledge management system should be done according to certain design principles. These design principles are categorized in three elements of a knowledge management system. The literature provides much more information about design principles of a knowledge management system than about performance indicators. A lot of scholars have done empirical and statistical research to knowledge management and provide design principles accordingly. However, the appropriateness of the design principles is determined by the context of the knowledge management system. In other words, the context must be identified first before searching in the literature for the right design principles. This new approach can be seen in figure 3.
2.2 Context characteristics

The identification of the type of context is determined by the characteristics of the context. So far, the following characteristics have been selected:

- Network (simple or complex)
- Number of stakeholders (small or big)
- Product (a decision, a design, a strategy, etc)
- Organizations (public, private or social)
- Organizational setting (intra or inter)

Management of knowledge has many similarities with management in networks. De Bruijn & ten Heuvelhoff (1999) distinguish four characteristics of a network. First of all, due to many different organizations (actors), interests, power and other aspects, a network can become plural. It demands different expertise to be able to coordinate the whole process, which is impossible to do by one actor. Consequently, the actors become mutually dependent. They need each other to accomplish their goals. Thirdly, actors are sensitive for control signals as long if it fit in their framework of core values. If these control signals are contradictory to the core values of actors, these actors can ignore the signals. A fourth and last characteristic of a network its dynamic nature. The positions of actors change constantly, which results in new mutual dependencies. These four characteristics will determine the complexity of a network and the sharing of knowledge accordingly.

A second characteristic of the context is the number of stakeholders. A large group of stakeholders makes knowledge management more complex in comparison to a small group. On the other hand, more stakeholders imply more knowledge to share.

A third characteristic of the context is the kind of product. In other words, what should be the result in the end? This could be a decision, a design, a strategy, etc. The kind of product determines how stakeholders will behave or which stakeholders should be included.

A fourth characteristic of the context is the organizational setting. An intra-organizational setting implies that the knowledge is managed within an organization, whereas an inter-organizational setting implies knowledge management between organizations. An inter-organizational setting is more complex than an intra-organizational setting (Riege, 2007).

A fifth characteristic is the type of organizations. The fact that an organization in an intra-organizational setting is private, public or social determines the core values and goals of an organization. In an inter-organizational setting it is important to know if all organizations are private (like a consortium), public (like a Steering Group), social (like a environmental organization), public-private (like a Public Private Partnership) or public-private-social (like a Sounding Board Group). A combination of private organizations has competitive—
issues and a combination of public organizations have political issues to consider.

This list of characteristics is assumed to be incomplete, but for the context of the case study (water policy-making) it proved to be sufficient. The relation of the characteristics of the context within the evaluation framework is shown in figure 4.

![Evaluation framework](image)

Fig. 4. Evaluation framework

The application of the new evaluation framework is illustrated in the case study.

4. Case study: Space for the River

4.1 Introduction programme Space for the River

In 2000, the Dutch national government started the programme Space for the River to deal with increased chance of flooding caused by an increasing discharge of the big rivers. The programme consist of approximately 30 projects that are all managed by different governmental institutions like the Directorate General for Public Works and Water Management (DGR), the provinces, waterboards and municipalities. The decentralization of project management in a river basin is a new phenomenon; until recently all river management projects were managed by the DGR. The reason is that the dominant approach to prevent flooding has changed from dike strengthening into giving the river more space. Where possible dikes will be relocated, hydraulic obstacles removed, flood bypasses created and floodplains lowered. Consequently, the social impact of flood prevention measures has increased, which requires more public participation in order to get social support and realize these measures within budget and planning. Regional and local government are considered to have more local knowledge and therefore, to be better capable of managing a project that requires intense communications with local stakeholders.

Most different public institutions (national, regional and local) will operate differently due to their different core businesses and hence, will probably manage the projects in a different way. In addition, the projects are scattered throughout the Rhine-delta, which means that the different project teams are geographical separated. By exchanging knowledge, the different project teams can increase the quality of their projects. Therefore, it is important that the knowledge management system is effective. By using the new evaluation framework, the weak and strong point of the current knowledge management system can be identified. An estimation of the exact level of effectiveness will be difficult to establish, because no comparison has been done with other projects.

4.2 Context characteristics of programme Space for the River

The first step in using the evaluation framework is to identify the characteristics of the context. For the programme Space for the River, the context is characterized by an inter-organizational setting only with public organizations (DGR, Provinces, Municipalities and Waterboards). These organizations have, in principle, the same interest (i.e. to accomplish the goals of the programme), and will only profit from knowledge sharing.
Additionally, they are not mutually dependent, which makes this network simple to manage. For example, the project-team of the Municipality Zwolle does not need the project-team of the Province Gelderland to manage their project. On the other hand, they can help each other by exchanging knowledge. At the moment, there are approximately 16 project-teams, which include 3 to 10 team-members. Together with the people working for the Programme Organization Space for the River (PDR), the number of people that could profit by sharing knowledge is quite big. In short, the characteristics of the context on within the programme Space for the River are:

- Inter-organizational
- Public organizations
- A large number of stakeholders
- The network is not complex
  - Same interests
  - Stakeholders are not mutually dependent
  - The network is dynamic
- The product is a to create a network that can be used to retain knowledge

Using the characteristics, the different public organizations form a ‘Community of Practice’ (CoP). CoP’s are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly. A CoP is characterized by mutual engagement, shared repertoire and joint enterprise (Wenger, 1998). Therefore, the knowledge management system must facilitate the CoP. The next section will indicate for each element of the knowledge management system, which design principles should be chosen for the knowledge management system to be effective.

4.3 Design principles

4.3.1. The people element. The first element to address is the people element. A CoP exists because it produces a shared practice as members engage in a collective process of learning (Wenger, 1998). This shared practice must be clear to all members. Therefore, it is important to identify the information that the members need. Another important aspect of a CoP is a sense of trust across its members. The community must create conditions that will indicate the trustworthiness and commitment of members towards other members (Lesser & Prusak, 1999; Lesser & Storck, 2001). The building of trust is done by face-to-face communication (Cong & Pandya, 2003). Furthermore, the sharing of knowledge in a CoP happens, because its members acknowledge the benefits. However, people can participate in different ways and in different degrees (Wenger, 1998). In order to stimulate participation, a reward system can be developed. This includes rewarding members on individual basis or as a community. Another stimulation to participate is providing resources, such as outside experts, travel, meeting facilities and communication technology (Wenger, 1998). At last, a CoP can help to identify the best practices that enable members to use the best knowledge for their own project. Therefore, it is important that best practices are identified, discussed and shared with the members (Marqués & Simón, 2006).

4.3.2. The process element. The second element to address is the process element. The members must be able to share knowledge with each other. Especially in geographically dispersed projects, CoP’s are challenged and constrained by the lack of opportunity to make direct connections to share knowledge. “If people meet each other it enables them to more quickly build a network of contact, foster interaction that allow for trust building. Without face-to-face encounters, the process of community building becomes less effective” (Lesser & Prusak, 1999: 6).

4.3.3. The technology element. The last element is the technology element. A way to facilitate a CoP is the development of shared repositories. In these shared spaces, the members can evaluate who is making contributions to the knowledge pool. This can create a sense of mutual trust. Another technique that facilitates
CoP is a technology that makes it easier to find and contact fellow community members (Lesser & Storck, 2001). The knowledge management system should include a kind of extranet where members can exchange documents and find contact information of other members. CoP’s should classify and organize all documents that are shared in order to establish a common mechanism for structuring and storing the collective memory of their members (Lesser & Storck, 2001).

4.4 Results

The literature of Communities of Practice provided a good basis to identify the most important design principles (see table 1). It is likely that some design principles have not been identified, which could imply that the conclusion require some nuances. Still, the identified design principle can point out some of the weak points of the knowledge management system that needs improvements. Several public organizations in the programme Space for the River have been interviewed. The results of the evaluation are presented in table 1 as well. Most design principles have not been addressed properly, which points out that the current knowledge management system in the programme Space for the River is not very effective and needs improvement to accomplish the goals of the programme.

Table 1. Results evaluation knowledge management.

<table>
<thead>
<tr>
<th>Element</th>
<th>Design principles effective knowledge management</th>
<th>Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>People</td>
<td>Best practices in one project are shared with other projects</td>
<td>No</td>
</tr>
<tr>
<td>People</td>
<td>Tasks are established to identify the information resources necessary for the organizations</td>
<td>Yes</td>
</tr>
<tr>
<td>People</td>
<td>Somebody informs of and rewards collaborators’ achievements</td>
<td>No</td>
</tr>
<tr>
<td>People</td>
<td>There are incentives to achieve the overall aims of the programme Space for the River</td>
<td>No</td>
</tr>
<tr>
<td>Process</td>
<td>The members have face-to-face communication</td>
<td>No</td>
</tr>
<tr>
<td>Technology</td>
<td>The members have a common database (extranet).</td>
<td>No</td>
</tr>
<tr>
<td>Technology</td>
<td>There is a system to codify explicit knowledge</td>
<td>No</td>
</tr>
</tbody>
</table>

5. Discussion

With the evaluation framework, existing knowledge is used in a different way, because many scholars provide lists of design principles for effective knowledge management (Riege, 2007; Fahey & Prusak, 1998). However, the difficulty is to use the type of context as a guideline to select from these lists the appropriate design principles. In the case study, the type of context has been identified as a Community of Practice. The choice for a CoP was based on a couple of context characteristics, but an exact relationship between the characteristics and the choice for a CoP has not been identified. The selection of the type of context has been done primarily using the scientific literature of CoP. In addition, it was stated that it is possible that not all design principles have been identified. These two uncertainties make additional research necessary. Therefore, it required to test the following assumptions:

- Using the characteristics of the context, all important design principles can be identified.
- If all design principles of a knowledge management system are addressed properly, spread over the elements people, process and technology, the system is effective

Another aspect in the evaluation framework that needs attention is the interpretation of the results. In the case study, the outcomes could only indicate the strong and weak points in the system. It was unable to provide
a kind of score on, for example, a scale from 0 to 10. But, is it necessary to have a score or is it sufficient to just indicate the strong and weak points? It depends if a manager must report the effectiveness of a knowledge management system to upper management or that it is a knowledge-manager-tool to identify the strong and weak aspects. One could argue that an exact score can help upper-management to legitimise an investment in improving a knowledge management system. But if the decision has already been made that the current knowledge management system needs to be improved, it is adequate to just show the strong and weak points of the system.

A last, the case study did not provide proof that the evaluation framework in a water-policy context is applied properly. No actual tests could be done considering the long lead-time of the programme Space for the River. Consequently, it has not been measured if the identified design principles were sufficient to improve the knowledge management system. Therefore, the implementation of a knowledge management system that has been improved using the design principles could indicate if the design principles were rightly selected.

6. Conclusion

The evaluation framework, presented in this article, can be used for estimating the effectiveness of a knowledge management system in every possible context. However, this article discussed only the context of water policy-making. Further research is required for identifying different contexts that are determined by their characteristics. In addition, the different types of context should be linked to a list of design principles. The literature provides sufficient knowledge for this. In the end, the evaluation framework should provide a list of design principles for every possible context.

References


Colophon

Front Cover:
Solitaire boom. Photo comes from Programme Organization Space for the River

Production, lay-out and front cover design:
Wytse H. Dassen, Delft

Printed by:
Wytse H. Dassen, Delft

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