AN INTEGRATIVE APPROACH TO KNOWLEDGE TRANSFER AND INTEGRATION: SPANNING BOUNDARIES THROUGH OBJECTS, PEOPLE AND PROCESSES

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Abstract

Knowledge transfer is the main challenge in knowledge management. Organizing deliberate knowledge transfer is not easy when considering the construction of knowledge as an outcome of social relations. The challenge of boundary spanning is widely discussed in literature (Brown & Duguid, 2000; Snyder et al., 2002). Last year at least three OLKC-papers addressed different perspectives on boundary spanning. Mengis draws attention to boundary *objects*; St. Amour et al., refer to the role *people* play as boundary spanners and Duijn and Rijnveld emphasized that *processes* of knowledge creation support boundary spanning between different groups. We argue that an integrated approach has utility for organizing knowledge transfer.

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Introduction
Knowledge transfer and integration is the main challenge in many knowledge management projects. This challenge follows from the observation that it is difficult to determine how and what knowledge may transfer from one person to another, from one team to another and from one network or organization to the next. A management attempt to deliberately organize specific knowledge transfer and integration between these entities is even a bigger challenge when considering the construction of knowledge as an outcome of social relations which is manifest in people doing things together through, "language, action and interaction" (Weick, 2001). Nevertheless the challenge of boundary spanning to facilitate knowledge transfer and integration between separate entities is widely discussed in literature and probed in many knowledge management projects (Brown & Duguid, 2000; Snyder et al., 2002).

At the 2007 OLKC-conference held in London, Ontario, Canada, at least three papers addressed the challenges in boundary spanning (Mengis; Duijn & Rijnveld; St-Amour et al.). In these papers three different perspectives on boundary spanning can be surfaced. Mengis draws attention to the function of boundary *objects*; St. Amour et al., refer to the role *people* play in serving as boundary spanners in communities of practice and Duijn and Rijnveld emphasized that the design of *processes* of knowledge creation support boundary spanning between scientists and policy professionals. These different perspectives on boundary spanning made us wonder whether the explanatory potential of knowledge transfer and integration might be heightened through an integrative approach since notions of boundary spanning in literature emphasize the role of the boundary spanning actor and objects as discrete constructs. Thus far we have no indication that the role of processes is recognized too when it comes to 'organizing' boundary spanning. An integrated approach that makes productive use of all three perspectives may have utility for scientists and policy professionals who have interest in knowledge transfer and translation projects.
We divide our discussion on this concept into four parts. In paragraph 1 we will describe a case study in spatial planning that shows evidence of developing and deploying the three perspectives on knowledge transfer and integration mentioned above. We will review the manifestation of each perspective in the described case study, along relevant theories. We will begin (in paragraph 2) with discussing (groups of) boundary spanning people since this tends to be the key perspective in the case study. In paragraph 3 we will discuss boundary 'objects' as a construct for boundary spanning. Next, boundary spanning through processes are discussed (in paragraph 4). Finally, we make an attempt to integrate the concepts and reflect on our integrative approach (in paragraph 5).

Paragraph 1. Case description
The case study is located at a city and a small village located in the South-Western part of The Netherlands, in the province of Zeeland. The province consists of several islands that are nowadays connected by land, dams and bridges, still one third of the area is water. Substantial parts of Zeeland are below sea level and its history is marked by a continuous struggle against the sea. Evidently, the coat of arms of Zeeland shows a lion emerging from the water with the motto "luctor et emergo"(5).

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5 In English: I struggle and emerge.

This story is situated near the capital of Zeeland, the city of Middelburg, where the small village of Arnemuiden is trying to protect its identity. In 1997, the village lost its status as an independent municipality and became a district of Middelburg. Ever since these administrative reforms, the spatial development of the rural area around Arnemuiden, is a controversial issue. A year before the 'annexation' of Arnemuiden, Middelburg elected an ambitious city council that was committed to give an impulse to the city. The spatial development plan for Middelburg (the so-called Quality Atlas)(6) was first presented in 1997 and showed an ambitious development towards 2030. The plans of inundating valuable agricultural land and building a considerable amount of new houses raised opposition in Arnemuiden against any spatial reform initiated by the municipality. The situation entered into a deadlock that lasted for several years, lastly calling for an alternative approach to policy making.

The case study described this alternative approach in which the interplay between different groups or communities is the key driver behind knowledge integration and transfer.

Starting a research project
In 2005, researchers from The Netherlands Institute for Applied Scientific Research (TNO) and the Erasmus University Rotterdam (EUR), in search for a research case for exploring innovative assessment techniques in policy making, came across the forementioned situation and approached a member of the Provincial Executive[7]. At that time, the province was working on a regional development plan(8) for the entire area around the lake. The area around Arnemuiden was still 'a blank spot' for which a spatial scenario had yet to be developed. Therefore, Arnemuiden appeared to be a suitable case for allowing the researchers to start building a consortium with policy authorities and public interest groups for making such a scenario. The following months were spent on talking with representatives from the city of Middelburg, the province and the water board of Zeeland, the regional department of the national ministry of water management, the organization for farmers, and the regional department of the national ministry of agriculture and nature development.

Kick-off meeting
The kick-off meeting took place at the provincial office in Middelburg, early 2006. All consortium partners, the press, several researchers and stakeholders joined the meeting and celebrated the start of the project with a glass of champagne. The meeting was chaired by the Provincial Executive who was an important champion of organizing the intended research process, by strongly supporting the project on the political level. Together with the alderman of Middelburg, she convinced other decision makers to give this process the freedom it needed. In the kick-off the mediator presented a planning for the coming months and asked for approval from the attendees. The central idea of the proposed approach was to form a core group at the heart of the process, composed of citizens, farmers and entrepreneurs from the local community of Arnemuiden. This group would be supported by experts and decision makers in its task of creating an advice for the spatial development of the project area.

Organization of the research process

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6 In Dutch: Kwaliteitsatlas Middelburg.

[4]The day-to-day administration of the Province is carried out by the Provincial Executive. The members of this body are chosen by the Provincial Council from among its own members.

8 In Dutch: Gebiedsvisie Rondom het Veerse Meer.

To facilitate a process with so many stakeholders, the research team decided to define six different groups (or communities) with their own role and task for creating the desired policy advice (see figure below). This idea originated from public policy communication and mediation, where the use of target groups is a well-known phenomenon. An **advisory group** was proposed at the core of the process, composed by people with a direct stake in the project area, such as citizens, farmers, associations, clubs, tourists and entrepreneurs. Their main task was to formulate an advice on the spatial development of the area between Arnemuiden and the fore mentioned lake. The advisory group was supported by a **process group** and an **expert group**. The former was composed of professionals (civil servants) from the municipality of Middelburg, the province of Zeeland, the regional department of water management, an engineering company, TNO's public policy mediator and the EUR. Their main task was to support the entire process by taking care of the daily management of the project. The other group, that of experts, was brought together to assess and evaluate the ideas of the advisory group and support this group by giving suggestions for improvement based on their expertise. The process group and expert group would be supported by a team of researchers of EUR, TNO and the forementioned engineering company. The representatives of the consortium joined a **supervision group** that guided the process on the political level and decided on the activities in every next project stage. Next to these groups mentioned above, some people had indicated their preference for a passive involvement by being informed about progress only. They were metaphorically placed on a **stand** but were allowed to attend all workshop sessions as 'spectators'. To finish the project organization, the researchers and the director of the co-funding innovation program formed a **reflective group**, critically scrutinizing the innovative quality of the process and providing the process group with advice.
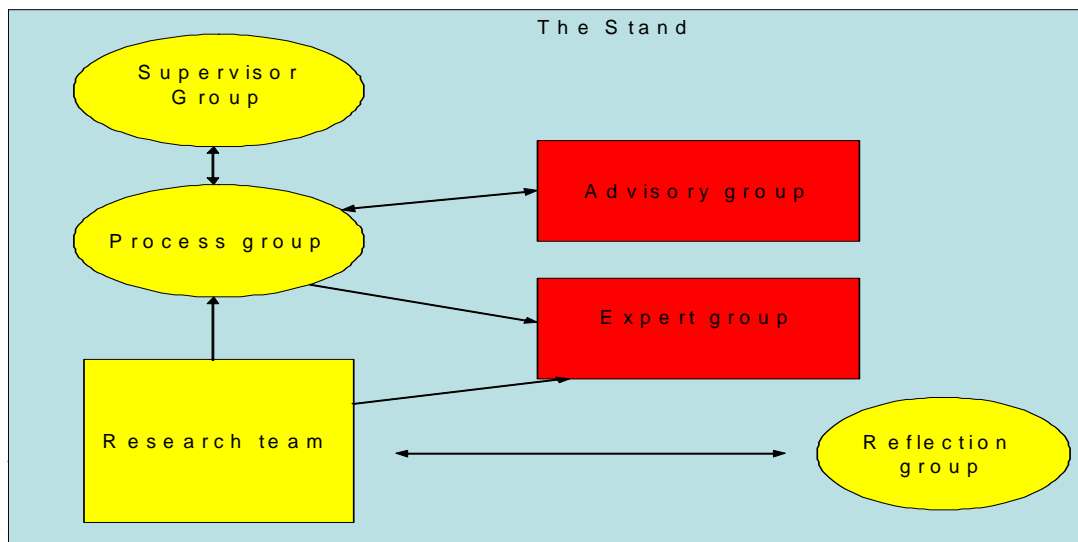
In March 2006, a next meeting was organized with the supervision group to whom the organization and planning was presented. The mediator proposed that the public process would consist of two main stages. During the first stage, the willingness of the intended participants to convene in a public policy process would be assessed. This "convening assessment" would be conducted by interviewing people who live in the project area and a selection of people with a professional stake. Next, an analysis of existing policy plans would be executed to clarify constraints and possibilities for (re-)developing the project area. The first stage would be completed by a report presenting the results of the interviews and characteristics of the area, as well as a

proposal for the second stage. As it was the starting point for extensive collaboration, this report and project planning must be accepted by local stakeholders, relevant expert-organizations and consortium partners. The second stage of the project was directed at collaboratively formulating spatial scenarios that, ultimately, would be translated into a policy advice.
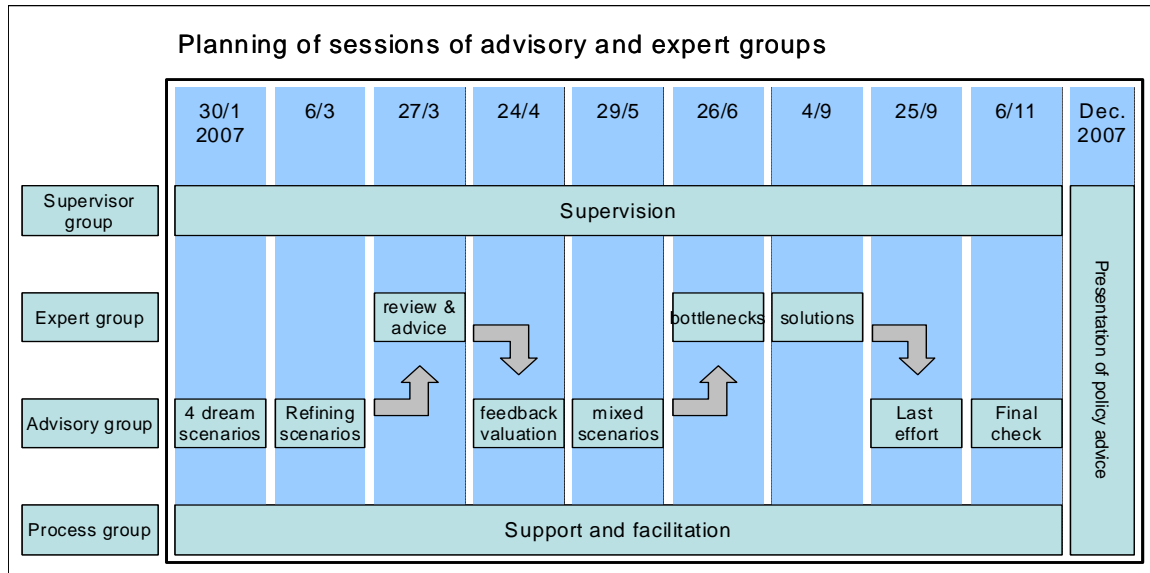
Planning of sessions of advisory and expert groups

	30/1 2007	6/3	27/3	24/4	29/5	26/6	4/9	25/9	6/11	Dec. 2007
Supervisor group				Supervision						Presentation of policy advice
Expert group			review & advice			bottlenecks	solutions			
Advisory group	4 dream scenarios	Refining scenarios		feedback valuation	mixed scenarios			Last effort	Final check	
Process group				Support and facilitation						

Figure 2: Planning of group sessions in the second research stage

First research stage: the convening assessment

The exploratory stage started in April 2006 by making an inventory of potential interviewees. The existing website was modified and short articles about the research project were published in local newspapers. Meanwhile, some sixty-three people were consulted personally through a face-to-face interview, conducted by the research team. Often, people were interviewed at home and their family members shared their opinion too, putting the listening skills of the interviewers to the test. Most farmers and entrepreneurs took the time to show their enterprises, which contributed to the understanding of the local situation. People were asked what they liked about the project area and what its weaknesses were. They talked about their dreams and fears and also about their involvement in the public policy process. The interviews were semi-structured and followed a list of items that needed attention. People were motivated to tell more about agriculture, water, infrastructure, recreation, businesses, housing and social structures in the area. Experts were asked the same questions as all other respondents. From every interview, a draft report was derived and sent to the respondent for approval or comments. The approved reports were used by the researchers for analyzing of the area's characteristics and assessing the feasibility of a collaborative research process.

Convening report as first stepping stone

To complete the first stage, the results of the convening assessment and the analysis of relevant policy documents have been combined into a convening report, setting out the path towards the policy advice by the end of 2007. The report contained an overview of strengths and weaknesses of the project area, as well as the organization and planning of the research process. A list of constraints for the area was included to

inform participants in advance about the limitations for the policy advice. Many people interviewed 'dreamt' about the return of water towards Arnemuiden, recalling the old days when the Arne, an ancient sea arm, connected the village to the sea where the pride fishing fleet sailed out and brought prosperity.

Kick-off of the second research stage
In November 2006, a first session was organized for both advisory group and expert group. It was the symbolic start of the research project, having all interested people invited in one room. The provincial executive and the alderman of Middelburg represented the political level and opened the meeting with short speeches, expressing their support and eagerness to receive an advice from the citizens. The mediator, after explaining the organization and steps of the collaborative research process, gave a short presentation about the outcomes of the interviews. He told that the opportunities of the area and the desires of its inhabitants had been evaluated and that four perspectives had become apparent as guiding principles for the future development of the area: 1) water, combined with nature, 2) water, combined with housing, 3) water, combined with recreation, and 4) water, combined with cultural and historic functions. The following months would be used to develop scenarios on these perspectives that would be merged into new scenarios, grounded on the most appreciated spatial elements from the four initial scenarios. In the kick-ff meeting the first informative and popularly written booklet(9) about the objectives of the research project and the outcomes of the convening assessment was distributed. The booklet also contained the preconditions that the actors involved had put forward for their participation.

Generating 'dream scenarios'
In January 2007, the first creative workshop session with the advisory group was organized. To create a creative atmosphere, the workshop program was kept fairly straightforward. After drinking a cup of coffee, people were asked to join one of the four groups, representing the perspectives on water combined with respectively recreation, housing, history and nature. The aim was to envisage the area's potential future development, by creating so-called 'dream scenarios' on one of the four perspectives. Participants were asked to dream without constraints about an ideal future. The facilitators incited everybody to write down their dreams on small notes. In every group some 50 to 100 ideas were collected, varying from realizing a new harbor and re-opening the Arne to small scale housing and nature development. The notes were clustered in co-operation with the sub groups by the researchers. Next the researchers asked which elements should definitely return in the dream stories. This resulted in lists of highly valuated dreams for every scenario. The session provided the researchers with enough information to start their homework of writing a dream story that would represent the sub group's 'ideal future'. The four stories would then be presented at the next workshop session with the advisory group.

Detailing the 'dream scenarios'
Some six weeks after the dreaming session, the advisory group gathered for the third time and discussed the dream stories that were written by the researchers. The facilitators asked for additional remarks and changes to the stories. In general, the participants appreciated the way their dreams were put on paper and only had some

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9 Notes from the Polder. In Dutch: Geluiden uit de polder.

minor remarks. Next, the dream scenarios were translated to a geographical map. In each sub group large aerial photographs were mounted on the wall and group members were asked to place the spatial functions of their dream story somewhere in the area. Every sub group made a spatial representation of the storyline by moving spatial functions (written on self-adhesive notes) that they had formulated in the previous workshop, around on a aerial photograph. These notes contained information on spatial functions such as housing, infrastructure and recreational facilities. To support the imagination of the participants, draftsmen joined the workshop sessions and sketched the spatial representation of the dream scenarios on a map. Besides this, an inventory was made of questions that the advisory group would like to ask the experts. Lastly, four draft maps were made to combine the improved dream stories with a geographical representation. Together with a list of 22 questions, the completed stories and maps would be sent to the expert group for critical review and answers to the questions formulated by the advisory group. The four dream scenarios were brought together in a second informative booklet(10), showing the progress of the research project.

Involvement of the expert group - 1
By the end of March, a session was organized with the expert group, representing various policy actors and special interest groups. The aim of the session was to receive answers on the questions posed by the advisory group about the feasibility of the dream scenarios. The session was opened by the alderman of Middelburg, who expressed his gratitude to the time the professionals would spend on the project. The session was led by one of the researchers who walked the experts through the list of questions from the advisory group. On the whole, most questions could be answered. It proved that virtually everything that the advisory group had come up with, was technically solvable, even radical options that required major construction works such as deepening the land to bring back water from the lake to Arnemuiden. Yet, financial resources would probably be the major obstacle in realizing the dreams. The mediator, who was present in the expert group as an observer, explained that the dream scenarios would not be realized as such, but that these new scenarios were made to generate localized knowledge from 'lay actors'. This knowledge would serve as a basis for the bottom-up conception of the intended policy advice.

Evaluation of dream scenarios
The fourth session with the advisory group was aimed at the identification of the most appreciated spatial elements in all four dream scenarios. This session was thoroughly prepared by the researchers who analyzed the scenarios for corresponding "building blocks" (spatial elements) and their constituting arguments. For instance, participants had previously indicated that they would like to re-open the Arne (building block) and had given historical, economical or esthetic reasons for doing so (arguments). For every dream scenario, a table was made linking these "building blocks" to one or more underlying arguments. Large prints of the tables were mounted on the wall. After a plenary presentation of the four dream scenarios, participants were given two stickers for each scenario, to mark their preferred element/argument combinations. They also received one red sticker to indicate their disapproval of a spatial element and its constituting argument(s). The results of the valuation would be used to

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10 Dreams from the Polder. In Dutch: Dromen uit de polder.

determine the elements that were highest appreciated and why they wanted them to be represented in the policy advice.
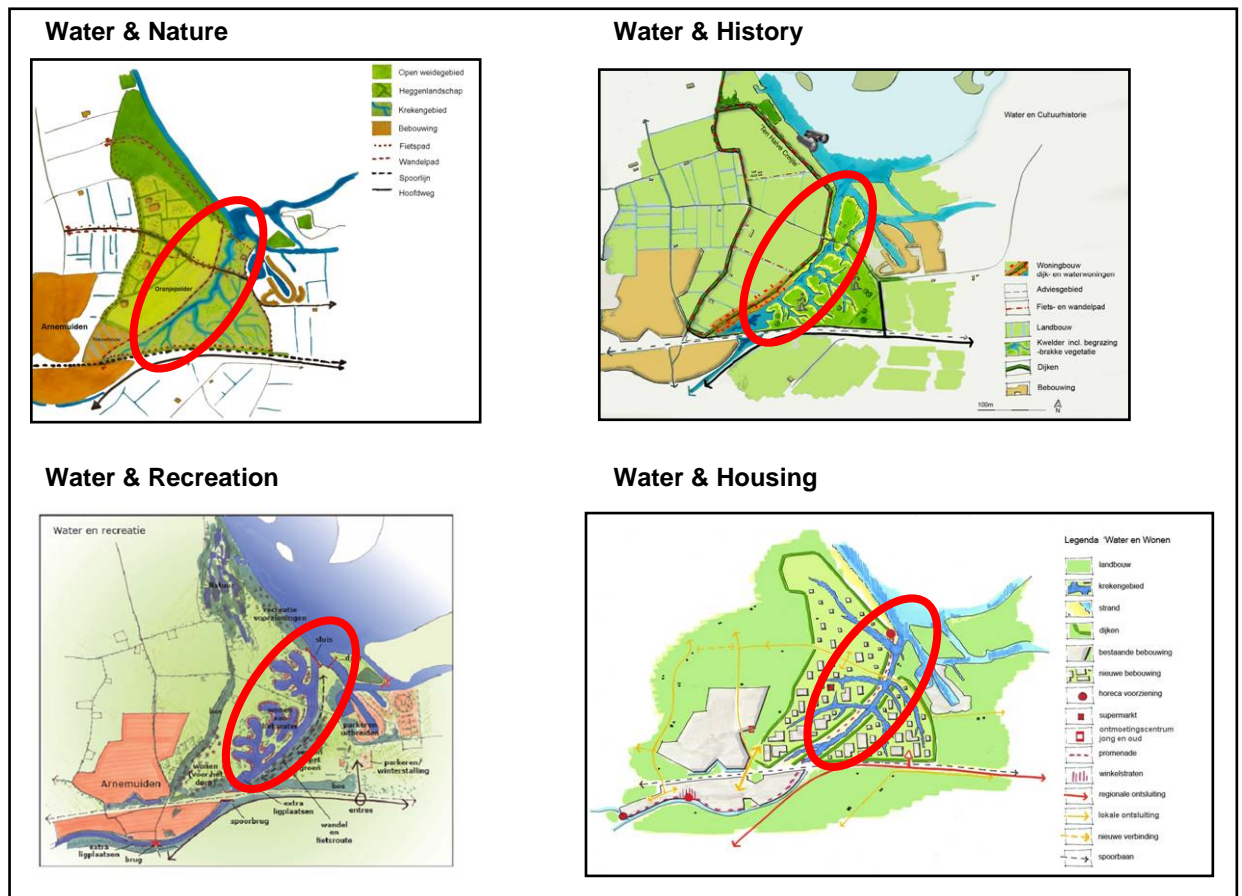
Analysis of preferences: two new scenarios

The analysis revealed a strong preference for bringing back water in the development area. Yet, some people preferred shallow coves in combination with nature development, while others favoured a deep creek suitable for navigation that would attract recreation to the historical village of Arnemuiden. Apart from restoring the historic water way, the preferences for other functions were more diffuse, revealing diverging degrees of acceptability between extensive and intensive spatial development of the area. It was clear that non-development was not favoured by the participants, and neither was an intensive urban expansion. The analysis of preferences indicated two new scenarios for the area that needed to be further elaborated by the advisory group. The advisory group identified a 'dark-blue' and a 'light-blue' scenario, referring to the intensity and scale of new water. Dark blue refers to relatively more and deeper water that had to be brought back to the area, re-connecting Arnemuiden to the lake in the north-east. Light blue represents the reconnection with the lake as well, but with shallow and smaller canals than in the dark blue scenario. The aim of the fourth session was to detail these two new scenarios. After presenting the preferences of the other elements, participants were asked to join either the dark-blue or the light-blue scenario for further elaboration. The scenario exercise started by discussing the character of the new water ways in the area and its exact location. Assisted by draftsmen, water was drawn on the map and then all other spatial elements ("building blocks") were reviewed and reconsidered, describing its function and determining its location in the design of the area. New

maps were presented showing potential development directions for Arnemuiden. A short report was written afterwards for each scenario, describing the elements and arguments behind both development directions.

Involving the expert group - 2: inventory of major obstacles
Before the summer holidays the expert group had discussed the two scenarios and to explored potential obstacles in realizing them. The idea was to collect perceived obstacles from professionals and allow them to work on solutions during summer. Their solutions would be offered to the advisory group after summer, giving them several options for refining the scenarios and improving their feasibility. Discussing the light-blue and the dark-blue scenario, the experts had no trouble identifying potential obstacles and consequences of physical changes in the area. The discussion resulted in an extensive list of potential 'bottlenecks'. The session was concluded by asking the experts to provide answers after the summer break, to support the advisory group in fulfilling her task of giving a reasonable advice to the supervisory group.

Involving the expert group - 3: solutions and advice
After the summer break, the experts reconvened for their third session in an attempt to propose and discuss solutions for the 'bottlenecks' that they had identified earlier. Most experts from the consortium parties had spontaneously contacted each other and had prepared a memorandum on typical spatial elements, such as traffic and infrastructure, water and housing. They offered, for example, a practical solution for dealing with the potential negative effects of saline water: create a small lake in stead of cutting through the dike and allow saline water to flow into the area. Though the discussion should have focused on the physical challenges of the scenarios, the discussion often drifted towards the financial feasibility of the scenarios[11].

The last effort and final check
In September the advisory group convened to make the last changes to the two scenarios. The experts had proposed suggestions that needed to be discussed. As the participants' values played an important role in the design of the scenarios, every suggestion was thoroughly argued before acceptance or rejection. In both groups, after every decision, the draftsmen would redraw the scenario. The evening was concluded with two refined and more precise drawings, based on which the researchers would rewrite the underlying story. At the last workshop session in November 2007, a final check of the scenarios was executed by the advisory group. As most members already agreed to the scenarios and did not show up at this meeting. Nonetheless, the process group thought of it as a necessary step allowing people to share their last remarks. Before closing the session, people were asked to play an active role in the presentation of the plans to the local counsil and administration. The mayor had agreed to receive the advice in person. Some members of the advisory group volunteered to present the advice and 'defend' its underlying ideas and rationale at the final meeting. The policy advice was published in the third and final informative booklet(12) that represents the outcome of the research project.

Presenting the policy advice: information market in the civil center

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11 The facilitator of the experts disregarded the fact that the participants in his session had dissimilar concepts in mind while talking about realisation. Discussions would typically end with stating that a certain solution would probably be very expensive.
12 Advice from the Polder. In Dutch: Adviezen uit de polder.

For the final presentation of the policy advice, the process group organized a so-called 'information market' in the civil center of Arnemuiden. The objective of this meeting was the formal presentation of the advice by a representative of the advisory group to the mayor of Middelburg and a delegation of the city council. After the formal presentation, members of the advisory group presented the scenarios and allow the counsil members to discuss the ideas with their constituents. The information market took place at December 19, 2007.

Discussing the separate perspectives in the integrated approach
As indicated we think that the case description shows some first signs of an integrated approach to knowledge transfer by simultaneously developing and deploying three different perspectives of boundary spanning: people, objects and processes.

Paragraph 2. People as Boundary Spanners
We argue that boundary objects have useful meaning only when they are developed by people who actively use them in their policy making efforts. People create boundary objects and put them in place and use them. People define situations in which boundary objects are deployed, for example, by identifying and defining the contextual frame of the boundary. At the same time, people themselves are able to function as boundary spanners by linking communities of different contexts, practices and agents as well as linking organizational networks. According to Daft (1989) boundary spanning is performed by people and primarily concerns the exchange of information, from an organization to its external environment. Leifer and Delbecq (1978) define boundary spanners as "people who operate at the periphery or boundary of an organization, performing organizational relevant tasks, relating the organization with elements outside it". This suggests that boundary spanners (people) are a strategic asset of any organization. The strategic value becomes manifest in communities of practice (CoP). In CoPs knowledge transfer and integration emerges 'spontaneously' between community members and between (organizational) communities and their external environment. In many cases community members form cohesive, stable relations with other communities, inside and outside the organization, thus enabling organizations to innovate (Brown & Duguid, 1991) and to maintain productive relations with its external environment. CoPs develop (advancing) practices that can be looked upon as 'boundary spanning activities' because knowledge creation, transfer and integration is a 'by-product' of conferring on and integrating new practices by community members. Communities of practice are therefore a second indication that an integrative approach towards knowledge transfer has merit. Moreover, this approach may serve as a management mechanism to strengthen an organization's (or team's) capacity for knowledge transfer and integration. How these initial thoughts have become manifest in the described case study is discussed in the following.

The case study shows the active role of people in knowledge creation, transfer and integration in a complex policy research project. The case study indicates the active involvement of over a hundred people in the research project. For keeping such an elaborate project manageable, productive and and transparent, these people were subdivided in separate groups along the specific interests they represent in the project area. This division was grounded on insights derived from the convening assessment. However, the division into separate, specialized groups does create additional knowledge boundaries that must be crossed (Tushman & Scanlan, 1978). The way in

this collaborative research project was organized, has created (knowledge) boundaries that must be overcome in the process of knowledge generation and integration. Leifer and Delbecq (1978) define a boundary as "the demarcation line or region between one system and another, that protects the members of the system from extrasystemic influences and that regulates the flow of information, material, and people into or out of the system".

We will not elaborate on all present groups in the research project but limit ourselves to the groups that have developed the most prominent boundary spanning activities: the mediator as most prominent boundary spanner But of course, (people in) all other groups have been involved in boundary spanning as well.

The activities of crossing the self-created (knowledge) boundaries is the main objective of the process group. This group is first and foremost instated for organizing the creation and transfer of (new) knowledge between advisory and expert group and between these groups and the supervisory group. We could argue that the members of this group function as 'human repositories' in the progress of the research project.

The activities of the process group are perhaps best represented by the role of its most prominent member, the mediator. The mediator plays an important role in the entire process as he is the figure-head for the research project, attracting all sorts of knowledge (anecdotes, complaints, emotions, opportunities) from various perspectives and interests. The mediator is responsible for keeping the project afloat, by moving forward in the desired direction, in both cognitive and relational respect. The mediator takes care of the materialization of newly created knowledge by putting new 'cognitive knowledge products' of the research project in place at the right time, such as the informative booklets. Thus, the mediator is responsible for putting new boundary objects in place in due time, thus facilitating the research's progress. In addition, the mediator is responsible for the relational progress by performing – litterally – boundary work between the distinguished groups. The mediator goes back and forth between the groups, informing them about the dynamics in all other groups. This enables the mediator to keep a keen eye on evolving opinions and forces within each group. In this respect, the mediator functions as an "exchange agent" (Leifer & Delbecq, 1978), taking care of the strategic relations within the entire research community that entails all groups involved. The 'processual knowledge' that follows from from going back and forth between the group enhances the capability and legitimacy of mediating between emerging differences or controversies on the expected outcomes of the research project. After all, people tend to 'suffer from progressing understanding' on what is at stake, through their active engagement in collaborative knowledge creation and transfer. By going back and forth between the groups the mediator is capable of surfacing any disturbing tendencies within each group, and legitimizes him to interfere with the project's direction.

The mediator is in the position to change the planning of the project as well as the efforts of the designated group(s), in case the cognitive progress and/or relational dynamics should not be directed (any more) at achieving the collaboratively objective, the presentation of a policy advice by the advisory group to the supervisory group. The mediator as boundary spanner could be perceived as manifestation of what Bolan (1971) and Fliegel and Kivlin (1966) call "change agents". These scholars argue that boundary spanners are involved in changing attitudes, perceptions, and values of community members. We could argue that the mediator has to function as a 'competent boundary spanner in a networked environment' (Williams, 2002). Williams denominated several skills of such a person, of which the reticulist skills and

relational and interpersonal skills are most relevant to the role of the mediator in the case study. The reticulist skills refer to the 'political skills and competences of connectivity' (cf. Williams, 2002; Webb, 1991 and Friend et al., 1974). The relational and interpersonal capacities of boundary spanners refer to "their ability to engage with others and deploy effective relational and interpersonal competences" (Williams, 2002).

Paragraph 3. Boundary Objects

Star et al. (1989) define boundary objects as "tangible artefacts or object-like forms of communication that inhabit several intersecting social worlds and satisfy the information requirements of each of them". We all have examples of these boundary objects in our own organizations. For example work manuals, intranet and forms usually try to cross boundaries between management and workforce. Mengis (2007) points to three reasons why boundary objects are (should be) able to facilitate the knowledge transfer and integration between different types of knowledge communities: They provide a shared language that allows for representing the domain specific knowledge in a structure and format that are known on the other side of the knowledge boundary (Carlile, 2002);

1. They provide a concrete means for specifying and learning about differences and dependencies across a boundary as rich representations of the own perspective invites to perspective taking (Boland, et al., 1995; Carlile, 2002);
2. They provide a form of reification around which the practices of the various actors and co-constructions of an emergent, shared meaning can be coordinated (Wenger, 1998).

Mengis (2007) advocates combining boundary objects with boundary-spanning activities. In this way knowledge integration and transfer across boundaries can gradually unfold (Wenger, 1998). This is another indication towards the potential for enhanced knowledge transfer and translation through a more integrated approach to boundary spanning. How these initial thoughts have become manifest in the described case study is discussed in the following.

The table below provides an provisional overview of the production and 'flow' of boundary objects between the distinguished groups. This overview is not exhaustive, but indicates the most prominent and tangible boundary objects in the three stages of the research project.

Preparation stage				
Boundary object	*Objective*	*From*	*To*	*Via*
Quality Atlas	Repository for municipality's spatial long-term ambitions – 'living document' that is 'ever-greened'	Municipality	Researchers	Process group
Regional Development Plan	Repository for the province spatial, long-term ambitions for the area around the lake	Province	Researchers	Process group

First research stage				
Boundary object	*Objective*	*From*	*To*	*Via*
Provisional Interview reports	Recording local knowledge about the project area	Researchers	Local stakeholders and experts (intended members of advisory and expert groups)	--
Reviewed interview reports	Refining and legitimizing the recorded knowledge	Local stakeholders and experts	Researchers	
Existing policy plans	Capturing the policies of the consortium / supervisory group members	Consortium members	Researchers	Process group
Convening report	Present the research project and outcomes of convening assessment	Process group	Supervisory group	Mediator
Informative booklet 'Notes'	Present the research project and outcomes of convening assessment; In a popular way	Process group	All groups	Supervisory group
Website	information sharing and capture storehouse	Process group	All groups	Supervisory group

Second research stage				
Boundary object	*Objective*	*From*	*To*	*Via*
Report on 4 scenarios & maps and expert questions	depicting 4 options for spatial development; identifying constituting questions	Advisory group	Expert group	Process group
Report on assessment of 4 scenarios & maps; Answers to questions	Providing additional information about feasibility of 4 scenarios	Expert group	Advisory group	Process group
Inventory of light blue/dark blue scenarios	Capturing two feasible and appreciated scenarios	Advisory group	Expert group	Process group
Report on assessment of light blue/dark blue scenarios	Providing additional information for completion of 2 scenarios	Expert group	Advisory group	Process group
Informative booklet 'Dreams'	Presenting the final dream	Process group	All groups	Supervisory group

	scenarios and options for development			
Informative booklet 'Advice'		Advisory group	Supervisory group / policy officials	Process group
Website	Information sharing and capture storehouse	Process group	All groups	Supervisory group

The table shows an coordinated accummulation and alignment of boundary objects towards a dedicated objective. The identified boundary objects convey knowledge between the distinguished groups, keeping them focussed and committed towards the collaboratively conceived objective: the formulation and presentation of a policy advice. In retrospect the researchers deployed several types of boundary objects, most of which have a written nature, such as reports and booklets, which were 'formally sanctioned' by the supervisory group before being published. But perhaps the most important repository was what Wells calls (1999) "semiotic mediation" with which he draws attention to the mediating role spoken language plays in the interaction between individuals engaged in knowledge transfer and learning. The research project itself generated a variegated collection of stories – apart from the spatial scenarios – that enhanced its meaning for the actors involved. The execution of an innovative research project in a 'real life' situation tends to be a story in itself that was actively monitored by the city council and the local press.

However Bechky (2003) indicates that "written and verbal explanations frequently failed to make meanings clear". Speech and text are not enough and therefore Becky advocates to deploy additional, tangible objects to transform knowledge across organizational boundaries. Bechky(13) found out that at some boundaries, "more concrete means (i.e. objects) were necessary to ground knowledge in a different context". In this way, community members were able to enrich their own understanding of a problematic situation, and work from there in finding a collaboratively conceived solution, that is a boundary spanning practice. In our case study, the use of geographical maps to identify opportunities for spatial development through specific functions, may be denominated as 'tangible objects' for transforming knowledge across the boundaries of the distinguished groups. The maps are capable of conveying what March and Simon (1958) call "tangible evidence of a problem". In our case, this 'problem' can best be understood as opportunities for improving the area's vitality and prosperity.

Paragraph 4. Boundary Spanning Processes
Knowledge creation is not straightforward. It does not subscribe to a recipe or 'standard' process. Rather than being restricted to a specific knowledge domain, knowledge creation increasingly takes place through active collaboration between diverse types of knowledge communities, such as experts and policy professionals as well as external stakeholders. In progressively more cases, knowledge becomes 'negotiated' in collaborative processes (Jasanoff, 1990; Funtowicz & Ravetz, 1993;

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13 In Bechky's study (2003), machines were the tangible object that were used for sharing understanding between members of different (organizational) communities: "these concrete manifestation of the problems proved to be meaningful to all the parties". Notice the resemblance with Orr's study (1990) where 'talking about machines' facilitated and mediated the knowledge sharing and transfer among repair men.

RMNO, 2000). Collaborative approaches are implemented for creating new bodies of knowledge from diverging sources. In these collaborative and creative processes, knowledge becomes transferred and integrated, arriving at new information, fit for implementation in decision or policy-making contexts. It is St-Amour's observation(14) that reframes Duijn and Rijnveld's (2007) approach to collaborative policy analysis into a processual perspective on boundary spanning.

How can we understand what happened in the entire process of knowledge generation, transfer and integration? Tushman and Scanlan (1978) denominate boundary spanning as "a two part process", that is composed of obtaining information from outside units and disseminating this information to internal users. In their view, community members are capable of understanding the meaning of knowledge on either side of the community boundary. They select relevant knowledge on one side and convey it to the other of the boundary. However this view on knowledge transfer has an 'modernistic' ring to it. It presupposes the capacity to overlook the collaborative processes of knowledge creation that evolve on either side of the boundary and perceives knowledge transfer form one side to the other, as a 'mechanical process'. In contrast, Carlile (2002) identified "three characteristics of a tool, method, or object that made them useful in joint problem solving at a given boundary". We propose to examine these characteristics for understanding processes of knowledge transfer across (organizational) boundaries, using boundary objects. In doing so, knowledge transfer can be denominated as a 'three stage process' that comprises 1) representation, 2) learning and 3) transformation.

If we look at these characteristics of from a processual perspective, representation refers to the articulation and imagination of existing knowledge of individuals involved, in order to enter into the process of learning. Learning refers to the identification of differences and dependencies between existing knowledge, in order to find similar elements as 'stepping stones' for transformation of existing knowledge. Transformation points to the process of refining and existing knowledge across boundaries, creating collaboratively conceived (new) knowledge. We argue that this 'three step process' is appropriate for understanding the situated and situational transfer of knowledge-in-use on either side of the boundary, whether this is mediated through boundary objects or 'just through speech and stories'. In each unique situation, for each unique purpose, knowledge transfer begins with an articulation and comparison of knowledge-in-use by the actors involved, followed by the identification of differences and dependecies of the existing knowledge bases. Next, based on this identification, the transformation of existing knowledge in for the situation and purpose adequate knowledge, can begin. In addition, these processes appear to are consecutive of each other: representation must be present before learning can take place and both functions should be in place before transformation, new collaborative knowledge replaces existing individual or collective knowledge, will develop. We argue here that on the indivdidual level, these processes will not be subsequent of each other, perhaps only analytically, but rather emerge simultaneously. The reason for this argumentation lies in my assumption that even experienced knowledgeables on either side of the boundary will be capable of (partially) seeing through and comprehending the consequences of transforming their knowledge-in-use: articulating and comparing knowledge is immediately followed by an (indicative) insight in their differences and dependencies and by a provisional idea on what new knowledge is needed for bridging these differences and dependencies.

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14 In the session policy and practice at the OLKC-conference in London, Canada, 2007.

Equally, Bechky (2003) warns for a (too) simplified view on knowledge transfer by "emphasizing that the tacitness of much knowledge often makes codification, transfer, and subsequent replication of routines and standard operating procedures difficult". In order to stay away from any modernistic connotation to knowledge transfer, Bechky (2003) also advocates to speak of "knowledge transformation processes", eliciting that 'something happens' with knowledge that crosses boundaries, being re-shaped and integrated to practices of different communities. She denominated two preconditions for members involved in finding a successful approach to knowledge transformation between their communities. Such an approach must first "invoke the differences in the work contexts" and second, "create common ground between the communities involved". The first precondition refers to the second step in Carlile's process of knowledge transfer, that is learning about differences and dependencies. The second precondition refers to specific characteristics of boundary objects that (should) facilitate the development of 'common ground'.

What is the common ground (cf. Bechky, 2003) in this case study? We could argue that the mutual acknowledgment that the previous 'formal' policy process for the development of the project area around the village of Arnemuiden has gotten stuck in a deadlock. Both policy actors as well as local stakeholders did not see a viable solution of of breaking this deadlock situation and, as a consequence, they resorted to an alternative approach. In addition, the mutual acknowledgment that the research process would surface opportunities for improving the area's vitality and prosperity, may be perceived as common ground for participating in knowledge transfer as well.

Paragraph 6. Reflection
From the analysis of the described case study along the three perspectives on knowledge transfer and integration it may have become evident that the collaborative research process functions as an interconnecting structure that binds people and objects together towards a dedicated and shared objective: the policy advice on the spatial development of a rural area.
Following the foregoing deliberations we might conclude that the three perspectives on knowledge transfer and integration, people, objects, and processes, can perhaps only be differentiated at an analytical level. People are the interlinking concept; only they are capable of identifying the need for knowledge transformation, the tangible evidence of a problem, and only they are capable of jointly exploring and constructing boundary objects that helps to share understandings and find common ground. This means that the three perspectives should be developed and deployed in a synchronized fashion, making the process of knowledge transformation unique to every combination of communities in which it emerges. Knowledge transformation in which boundary spanners are repeatedly involved, using collaboratively constructed boundary objects, function as 'collective memory' for the sensemaking endeavour. Here the 'balancing act' becomes manifest: each community member, engaged in cross-boundary practice, has to synchronize the ongoing development practice-based knowledge within his/her community with the demands and dynamics of cross-boundary work. In turn, each interaction between boundary spanners – whether successful or not – adds to the collective memory of the cross-boundary community. The knowledge 'recorded' in this collective memory has to be synchronized – or made usefull to – the knowledge of the constituting communities. In this respect, collaborative research projects that are driven by cross-boundary knowledge transfer

and integration, aimed at solving complex problems, tend to become efforts of joint sensemaking (Weick et al., 2005).

As indicated in the case study the groups (and their members) have engaged in a process of finding out 'what is going on', and 'what might be possible'. Gasson (2005) has directed us to 'the sensemaking capacity' of knowledge management and transfer, accurately indicating that we must be "engaged in that detached sensemaking and analysis, by which situated knowledge is externalized, reified and made explicit". This challenge is relevant for resolving problems that exceed the capacity of one group or community. In such occassions community-based knowledge must to be transferred because group members have to work across (knowledge) boundaries. For this, knowledge has to be externalized and made explicit, e.g. with boundary objects. Group members that are engaged in creating and sharing new knowledge is often not aware of the fact that this could have meaning beyond the boundaries of their his/her group. At the same time, community members must be capable of transforming that knowledge into something other communities are able to relate to, thus spanning boundaries across practices and communities. Weick (1995) advocates that knowledge transfer process requires "joint sensemaking, that is, a mutually-negotiated understanding of how to make sense of the local, organizational world of work and interaction". Thus, knowledge transformation processes across community (intra- or inter) organizational boundaries are largely about joint sensemaking. Sensemaking might be perceived as a pragmatic approach to knowledge transfer (cf. Carlile, 2002) which that productively integrates the three distinguished perspectives: people, objects and processes.

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