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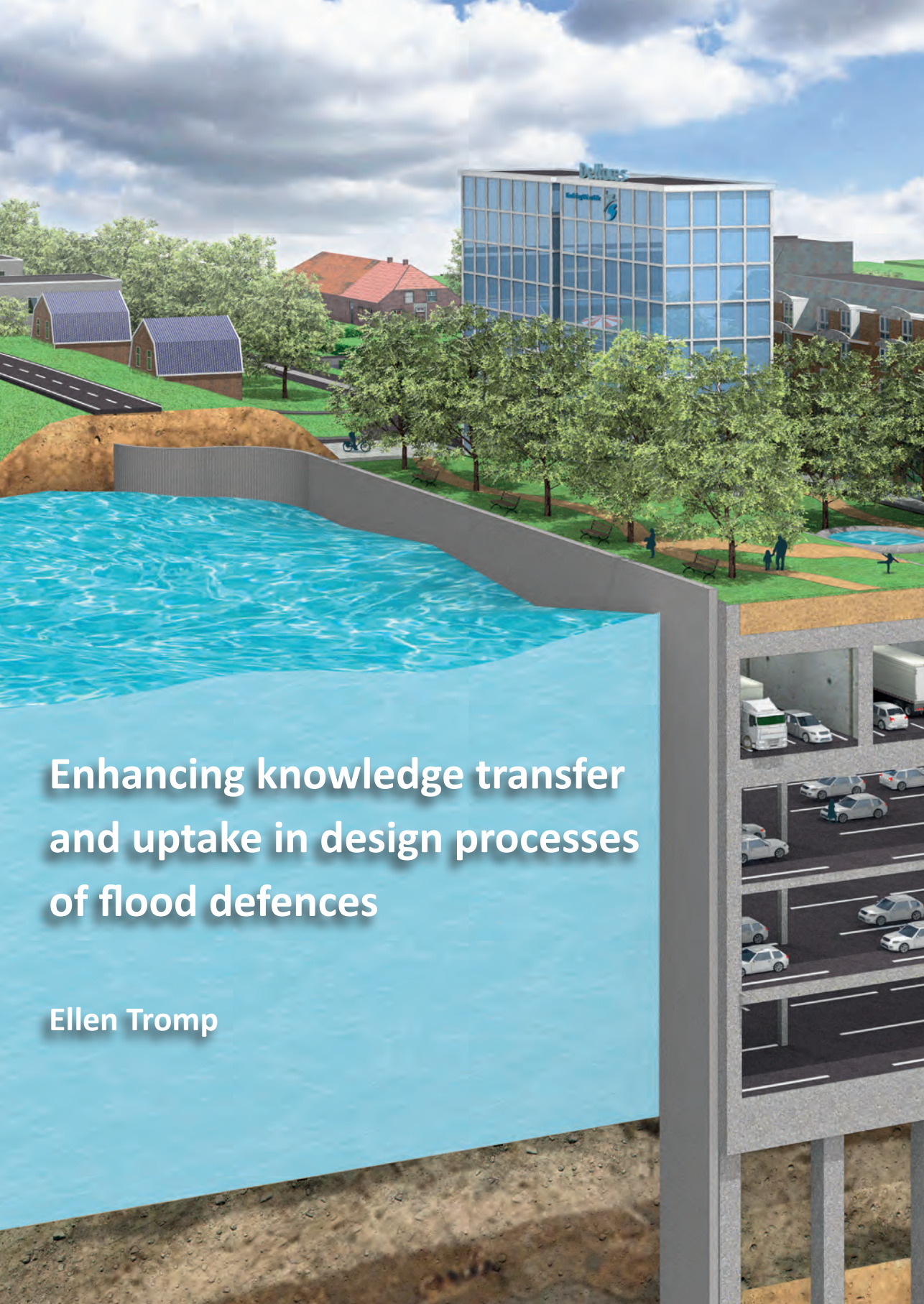

Enhancing knowledge transfer and uptake in design processes of flood defences

Ellen Tromp

Enhancing knowledge transfer and uptake in design processes of flood defences

Dissertation

for the purpose of obtaining the degree of doctor

at Delft University of Technology

by the authority of the Rector Magnificus, prof.dr.ir. T.H.J.J. van der Hagen,

chair of the Board for Doctorates

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Monday 11 November 2019 at 15:00 o'clock

by

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Voor pap†, Maurits en Reinier

Photo by Ellen Tromp of Hedendaags Delfts blauw ontwerp in Zuiderzee Museum, Enkhuizen by Hugo Kaagman 2008

Contents

Dankwoord

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Summary

For many years the Netherlands has protected itself against high river discharges and storms by means of a network of dikes, dams and (other) hydraulic structures. Traditionally, water safety has therefore mainly been the domain of engineers. In recent decades, the regulations on water safety have been further institutionalised. Knowledge in the field of flood risk management is strongly linked to policy; new knowledge can therefore have far-reaching consequences. Dutch flood risk management policy addresses new knowledge by jointly developing procedures for assessing safety and reliability, and weighing these values against affordability. Because flood defences often fulfil other functions as well, the flood protection domain requires a balance between many more values: regional water authorities, provinces and municipalities must take more account of spatial integration and coupling opportunities, climate (adaptation), and circular economy.

Within the Dutch Flood Protection Programme (DFPP) these values are weighed up within the dike reinforcement projects. The DFPP stimulates the development of innovations, often involving the development of new knowledge, also with the aim of being able to carry out the national task better, faster and/or cheaper. Despite all efforts, the innovations do not yet enjoy sufficient confidence in relation to the existing dike reinforcement alternatives, which means that they are not yet fully considered. We also see that the projects involve participatory design processes in which the interests of citizens and businesses are more central. Within this process, visions and various types of knowledge are shared with each other. The need to share and use knowledge is clear.

However, the use of knowledge in dike reinforcement projects is problematic along three dimensions. (1) The decision-making power is distributed over the stakeholders, and therefore requires commitment from those stakeholders. (2) Knowledge, where available, is also distributed over stakeholders. Content-related and/or strategic uncertainties give reason not to share this knowledge. (3) Because knowledge is situated, knowledge exchange between stakeholders is intrinsically difficult. This impedes the use of knowledge. Although the institutional framework within which projects are carried out in the Netherlands addresses some of these dimensions, the available knowledge is used only to a limited extent.

Research objective

This research focuses on supporting knowledge transfer. Within the NWO research programme ‘Integral and sustainable design of multifunctional flood defences’, the aim was to develop both the technology and the administrative instruments needed for the implementation of multifunctional flood defences. As part of that programme, we focused on the question of whether the knowledge developed is actually being used in the design processes of flood defences.

The aim of this research was to better understand (a) how (creation), transfer and uptake of knowledge in practice takes place within the design processes of (multifunctional) water barriers, and (b) which interventions can improve the transfer and transfer of knowledge in the design processes. To achieve this goal, we first asked ourselves the following two questions:

1. Which factors can explain knowledge transfer and transfer (or the lack thereof) in the design process of multifunctional flood defences?
2. How can these potential determinants for knowledge transfer and uptake be observed in practice?

This has resulted in a framework that we have tested by applying it to a historical case: the dike reinforcement Kinderdijk – Schoonhovenseveer (KIS). The research question we asked ourselves was:

3. Does observation allow a plausible explanation of processes and outcomes, and thus a diagnosis?

This question was also leading for the action research within the dike re-design project Gorinchem – Waardenburg (GoWa). We also asked ourselves the following research question:

4. Which interventions can improve knowledge transfer and knowledge transfer in the design processes of multifunctional flood defences?

Based on our observations and diagnoses of interaction moments in the GoWa project, we proposed interventions to improve knowledge transfer within the action research. Where possible, we also looked whether this led to improved knowledge transfer and uptake improved. This has resulted in a methodology for observing, diagnosing and intervening in real time the knowledge transfer and uptake.

The researcher combined her role within the GoWa project with that of knowledge and innovation advisor at the DFPP Programme Management, which coordinates and subsidises all dike strengthening projects in the Netherlands. This provided an opportunity to investigate whether the developed methodology could be transferred to practitioners within different scopes: project, regional water authority and national programme. The question we asked ourselves was this:

5. Does the framework work in practice and does the action-oriented approach contribute to the development of the professional field?

FODIKI- methodology

First, we looked for a way to frame a specific situation as moments of knowledge transfer, and to observe these knowledge interaction moments with an eye for attitude, behaviour and use of language. In analogy to the medical world, we can make a diagnosis (D) on the basis of the observations (O), and then propose a 'treatment plan' on the basis of this diagnosis to improve the knowledge transfer with specific interventions (I). We call this method the FODIKI methodology, an acronym for 'Framing, Observing, Diagnosing, and Intervening in Knowledge Interactions'. This methodology, consisting of a conceptual framework and associated approach, is the most important product of this research.

We frame interactions between stakeholders in the design processes of dike reinforcement as knowledge transfer moments in which a sender (S) tries to transfer knowledge (K) to a receiver (R). If the transfer succeeds, then K is available for R, and R can use that K. Knowledge transfer is possible if seven preconditions are met: (1) K is

relevant, S has both (2) the freedom and (3) the willingness to share that knowledge, (4) S trusts R, (5) R has a need for knowledge, (6) K meets that need and (7) R finds K reliable. The receiver's need for knowledge may arise from legal provisions (MIRT procedures, MER, etc.). We consider knowledge transfer to be successful when it corresponds to the second level of knowledge utilization (*cognition*, preceded by *reception*) as defined by Knott & Wildavsky (1980). The five levels above cognition give a cumulative scale for what we mean by knowledge throughput. The scale is cumulative in the sense that each successive level builds on the previous one: *reference, effort, adoption, implementation,* to *impact.*

In a knowledge interaction moment, we can observe the transfer of K by S to R, and diagnose possible obstruction in terms of three types of barrier: (1) *transmission* barrier, (2) *cognitive* barrier and (3) *psychological* barrier.

We diagnose the absence uptake of K in terms of seven types of failure mechanisms: (1) *incorrect use* of K, (2) *institutional restrictions*, (3) *resource-related restrictions*, (4) *dissipation* of K, (5) *strategic use* of K, (6) *disqualification* of K by a third party, and (7) *no relay,* i.e., no transfer by R (now as sender of K) to a new receiver because of barriers in this next knowledge interaction moment.

Proof of concept

In order to test whether the framework allows knowledge interaction moments to be meaningfully framed, observed and diagnosed, we first applied it to the historical case study: the design process of the dike reinforcement project Kinderdijk – Schoonhovenseveer, a trajectory of 12 km. Along this dike there is a lot of ribbon development in or near the dike. In order to reduce the hindrance during construction, the Rivierenland regional water authority performed a practical test for two innovations in the exploration phase of the project. In this case we looked at how the knowledge transfer between (1) the project team and the subsidizer, (2) the project team and the citizens, and (3) the project team and the contractors of the innovations took place. This ex-post application enabled us to further improve the framework and working method.

Practical application

The next step was to apply the framework in an on-going project: the dike reinforcement between Gorinchem and Waardenburg (GoWa). Here the dike must be reinforced over the entire 23 kilometres. Besides three municipalities and two provinces, companies, residents and interest groups are also involved in this project. We worked with the project team for three years, until the regional water authority formally decided on the preferred alternative. We had access to all meetings and relevant documents. The project team wanted us to be involved in the intensive community engagement process, in which more than 100 active residents participated. During our involvement a new project team was formed, consisting of employees of three contractors, a consultancy firm and the regional water authority, because Rivierenland regional water authority opted for an alliance as a form of cooperation.

We have used the 'action research spiral'. Each meeting that we attended formed an iteration, in which *plan*, *act & observe* and *reflect* activities succeeded each other: the project team members plan a next meeting and often chaired it, while the researcher observed directly and/or by means of questionnaires. We used the FODIKI framework to jointly think about the effectiveness of the meeting, about the question which exogenous factors and social mechanisms might explain the observations, and about possible adjustments of the proces design that could improve the knowledge transfer and uptake in subsequent meetings.

In the period December 2015 - November 2018, the researcher carried out the action research according to a transparent protocol. Initially, she had complete freedom to intervene and contribute to the process design. Where possible, meetings were set up as a quasi-experiment, aimed at testing specific propositions about the effectiveness of specific interventions, drawn up in advance by the researcher and the project team. When scripts were available, the researcher made a hypothesis beforehand about the barriers and failure mechanisms that could occur, and sometimes communicated these with project team members and sometimes not. In addition, during meetings, based on observations, she shared her diagnoses in real time with project team members to indicate where the knowledge transfer failed, so that they could act on it.

After the start of the alliance, Q3 2017, the arrival of new alliance colleagues changed her position within the team, making it less easy for her to intervene. As trust in the researcher gradually grew, she again had more opportunities to improve knowledge transfer and uptake.

In total, we analysed more than 130 knowledge interaction moments. In doing so, the framework was converted into the FODIKI framework as described above. In the interaction moments it appeared that trust could be indirectly observed through attitude and behaviour, and also through surveys that were distributed at the information meetings (average response rate around 65%). During the knowledge interaction moments between the project team and the public, in 9 out of 10 cases one or more *cognitive* barriers occurred; by contrast, the *psychological* barrier, occurred only rarely. In the knowledge transfer between the project team and the authorities, we did see psychological barriers. This was because the delegates of the provinces and municipalities in the AMG and EMG were asked to act differently as they were asked to incorporate where possible the ideas of the ensembles in their policy and planning, which led to a psychological barrier, as the project team failed to clarify this new role. The *transmission* barrier occurred least frequently, usually due to problems with equipment or presentation skills of the speakers. Of the failure mechanisms, *disqualification* and *no relay* were the most common, especially in the interaction between project team and the public. Between the professionals we saw relatively often *dissipation* and *resource-related restrictions* occur. Furthermore, we saw that if R gives feedback to S and indicates what he needs, many barriers can be overcome. We also saw that trust can be built up during the process.

The GoWa case has produced a number of important insights: there is much to gain by carefully considering the intended receiver's need for knowledge when designing ex-ante the process of a meeting, defining the intended message and making it compatible

with the receiver's language and jargon, and by maintaining and developing trust, both between S and R themselves and in the K to be transferred. Because the knowledge transfer process consists of (sometimes parallel) chains with many links, it is important that when planning design processes, these chains are also consciously designed. In the run-up to the formal decision moments that mark the phase transitions in a MIRT project, but also to crucial meetings of the informal institutions (SBG, AMG, EMG), process managers must anticipate the knowledge needs of parties and make them aware of the role they play in the links of a knowledge chain.

Possible interventions and transferability of the methodology

In this study we distinguish three intervention categories to improve knowledge transfer and uptake: (1) knowledge management, (2) process management, and (3) steering in the policy network. In the interaction moments in which we intervened, knowledge management interventions were mainly carried out to overcome cognitive barriers. In some cases, process management interventions were carried out to mitigate failure mechanisms. We found that observing and diagnosing in the interaction moments is at least as important as carrying out an intervention in order to enhance the knowledge transfer and uptake.

The FODIKI framework expands the widely accepted conduit model by integrating other elements from scientific literature in a semantically sound manner. The concepts are sufficiently operational to be observed, so the condition of construct validity is satisfied. This enabled the researcher to give consistent meaning to her observations. She has always verified her diagnosis with stakeholders, actively seeking feedback and criticism, and acting upon it. Throughout the research, the use of the framework shifted from ex-post diagnosis towards diagnosis and (in)direct interventions in real-time. In the GoWa case, the researcher refined the social mechanisms by detailing their explanation and how they can be observed in real-time circumstances, but the types of mechanism have remained the same, preserving semantic coherence. The framework appears robust, and affords observation and diagnosis of the observed interaction moments, which means that the condition of internal validity is met.

External validity entails that findings are generalisable across a range of situations. The unit of analysis of the FODIKI framework was a single knowledge interaction moment, and although we investigated only one 'live' case, we analysed more than 130 knowledge interaction moments. Moreover, the GoWa case is representative for projects within the Dutch Flood protection domain, as it follows the MIRT-approach and is in terms of complexity mainstream project within the DFPP programme.

The external validity also depends on whether the FODIKI methodology can be transferred to other stakeholders, so that they can use the ODI for knowledge transfer and uptake. Within the GoWa case, we tested this in a master-apprentice construction. For two years, the researcher acted as an expert in transferring the method at project level. The researcher applied the framework in analysing her own actions in the field of knowledge transfer and uptake. In an intervision process, the researcher offered tools to make observations during meetings, to diagnose them and to act according to the findings. After two years, the FODIKI methodology was handed over to three employees working in the field of environmental management, and is still being applied on a daily

basis. Important prerequisites for a quick adoption by the apprentice are an open attitude of the apprentice, and his ability to internalize new working methods. Within both the RWA scope and programme scope, the researcher conducted intervision trajectories. The uptake of the FODIKI methodology was more difficult within these scopes, as it also depends on the absorptive capacities of these organisations. The researcher only partially succeeded in creating awareness of the importance of knowledge transfer and uptake, limiting the uptake to the level of *cognition* (within programme scope) and *effort* (within RWA scope).

The starting point for research was that knowledge transfer takes place in a chain of interactions between people. Our observations show that knowledge transfer indeed takes place at the elementary level between sender and receiver, and that the chains in a knowledge transfer process are designable, albeit within the limits that the political context will inevitably set for the interventions. For the application of FODIKI within projects, we recommend to always focus on a series of knowledge interactions, to design these with an eye for the variables in the framework, while keeping in mind that attention for knowledge transfer and uptake is not yet self-evident to stakeholders in dike reinforcement projects. To change this, both within regional water authorities and at programme level, an institutional framework should be developed that prescribes permanent processes aimed at learning across projects.

From a scientific point of view, it is advisable to interpret more systematically the drivers that influence the needs of a receiver. The researcher was able to distil these (as confirmed in cross validation), but this may be due to her many years of experience: the present framework does not yet offer specific concepts and tools for diagnosing these drivers. It also appeared that the psychological barrier is difficult to identify in practice, and calls for a more systematic interpretation. Finally, we have seen that the challenges in the field of knowledge management and organisational management, such as the dynamics, scale and time effects, discontinuity and context, also persist within the domain of Flood Risk Management.

Samenvatting

Sinds jaar en dag beschermt Nederland zich tegen hoge rivierafvoeren en stormen door middel van een netwerk van dijken, dammen en kunstwerken. Van oudsher is waterveiligheid daarom vooral het domein geweest van ingenieurs. In de afgelopen decennia is de regelgeving rondom waterveiligheid verder geïnstitutionaliseerd. Kennis op het gebied van waterveiligheid is sterk gekoppeld met beleid; nieuwe kennis kan daardoor verstrekkende gevolgen hebben. Het Nederlandse waterveiligheidsbeleid gaat in op nieuwe kennis door gezamenlijk procedures te ontwikkelen voor het beoordelen van veiligheid en betrouwbaarheid, en het afwegen van deze waarden tegen betaalbaarheid. Omdat waterkeringen vaak ook andere functies vervullen, vraagt het waterveiligheidsdomein om een afweging tussen veel méér waarden: waterschappen, provincies en gemeenten moeten meer rekening houden met ruimtelijke inpassing en meekoppelkansen, klimaat(adaptatie), en circulaire economie.

Binnen het Hoogwaterbeschermingsprogramma (HWBP) worden deze waarden afgewogen binnen de dijkversterkingsprojecten. Het HWBP stimuleert de ontwikkeling van innovaties, waarbij veelal nieuwe kennis wordt ontwikkeld, ook met het doel om de landelijke opgave beter, sneller en/of goedkoper uit te kunnen voeren. De innovaties genieten – ondanks alle inspanningen – nog onvoldoende vertrouwen ten opzichte van de bestaande dijkversterkingsalternatieven, waardoor ze nog niet volwaardig worden meegenomen. Daarnaast zien we dat binnen de projecten participatieve ontwerpprocessen plaatsvinden waarbij het belang van de burger en bedrijven meer centraal komt te staan. Hierbinnen worden visies en diverse soorten kennis onderling met elkaar gedeeld. De noodzaak om kennis te delen en te gebruiken is duidelijk.

Het gebruik van de kennis bij dijkversterkingsprojecten is echter problematisch langs drie dimensies. (1) De beslismacht is verspreid over de stakeholders, en vraagt daarom commitment van die stakeholders. (2) Ook kennis, voor zover beschikbaar, is verspreid over stakeholders. Inhoudelijke en/of strategische onzekerheden geven aanleiding om deze kennis niet te delen. (3) Omdat kennis gesitueerd is, is kennisuitwisseling tussen stakeholders intrinsiek moeilijk. Dit staat gebruik van kennis in de weg. Het institutionele kader waarbinnen de projecten in Nederland worden uitgevoerd, komt aan een deel van deze dimensies tegemoet, maar toch wordt de beschikbare kennis slechts beperkt gebruikt.

Doel van het onderzoek

Dit onderzoek richt zich op het ondersteunen van kennisoverdracht. Binnen het NWO-onderzoeksprogramma *'Integral and sustainable design of multifunctional flood defences*' was het doel om zowel de technologie als de bestuurlijke instrumenten te ontwikkelen die nodig zijn voor de implementatie van multifunctionele waterkeringen. Als onderdeel van dat programma hebben we ons gericht op de vraag of de ontwikkelde kennis daadwerkelijk gebruikt wordt bij de ontwerpprocessen van dijkversterkingen.

Het *doel* van dit onderzoek was om beter te begrijpen (a) hoe (creatie), overdracht en doorwerking van kennis in de praktijk plaatsvindt binnen de ontwerpprocessen van (multifunctionele) waterkeringen, en (b) welke interventies de kennisoverdracht en -doorwerking in de ontwerpprocessen kunnen verbeteren. Om dit doel te bereiken hebben we ons eerst deze twee vragen gesteld:

1. Welke factoren kunnen kennisoverdracht en -doorwerking (of het ontbreken daarvan) in het ontwerpproces van de multifunctionele waterkeringen verklaren?
2. Hoe kunnen deze potentiële determinanten voor kennisoverdracht en -doorwerking in de praktijk worden waargenomen?

Dit heeft geresulteerd in een raamwerk dat we hebben getoetst door het toe te passen op een historische casus: de dijkversterking Kinderdijk- Schoonhovenseveer (KIS). De onderzoeksvraag die we ons daarbij hebben gesteld was:

3. Maakt observatie een plausibele verklaring van processen en uitkomsten, en daarmee een diagnose, mogelijk?

Deze vraag was ook leidend voor het actieonderzoek binnen het dijkversterkingsproject Gorinchem – Waardenburg (GoWa). Daarbij hebben we ons ook de volgende onderzoeksvraag gesteld:

4. Welke interventies kunnen de kennisoverdracht en -doorwerking in ontwerp-processen van multifunctionele waterkeringen verbeteren?

Binnen het actieonderzoek hebben we op basis van de observaties en diagnoses interventies voorgesteld om de kennisoverdracht te verbeteren. Waar mogelijk hebben we ook gekeken of de kennisoverdracht en -doorwerking daardoor verbeterde. Dit heeft geresulteerd in een methodologie om in real time kennisoverdracht en -doorwerking te observeren, te diagnosticeren, en te interveniëren.

De onderzoeker combineerde haar rol binnen het GoWa project met die van adviseur kennis en innovatie bij de Programmadirectie HWBP, die alle dijkversterkingsprojecten coördineert en subsidieert in Nederland. Dit bood de kans om te onderzoeken of de ontwikkelde methodologie overgedragen kan worden aan praktijkprofessionals op verschillende niveaus: project, waterschap en landelijk programma. De vraag die we ons daarbij gesteld hebben was:

5. Werkt het raamwerk in de praktijk en draagt de actiegeoriënteerde aanpak bij aan de ontwikkeling van het professionele vakgebied?

FODIKI- methodologie

Allereerst hebben we gezocht naar een manier om een specifieke situatie te kunnen framen als momenten van kennisoverdracht, en deze kennisinteractiemomenten te kunnen observeren met oog voor attitude, gedrag en taalgebruik. In analogie naar de medische wereld kunnen we op basis van de observaties (O) een diagnose (D) plegen, en dan op basis daarvan een ‘behandelplan’ voorstellen om met specifieke interventies (I) de kennisoverdracht te verbeteren. Deze werkwijze noemen we de FODIKI-methodologie, acroniem voor ‘*Framing, Observing, Diagnosing, and Intervening in*

Knowledge Interactions'. Deze methodologie, bestaande uit een conceptueel raamwerk en bijbehorende aanpak, vormt het belangrijkste product van dit onderzoek.

We framen interacties tussen stakeholders in de ontwerpprocessen van dijkversterkingen als een kennisoverdrachtsmoment waarin een zender (S) kennis (K) probeert over te dragen aan een ontvanger (R). Als de overdracht slaagt, dan is K beschikbaar voor R, en kan R die K gebruiken. Kennisoverdracht is mogelijk als wordt voldaan aan zeven precondities: (1) K is relevant, S heeft zowel (2) de vrijheid als (3) de bereidheid om die kennis te delen, (4) S vertrouwt R, (5) R heeft een kennisbehoefte, (6) K voorziet in die behoefte en (7) R vindt K betrouwbaar. De kennisbehoefte van de ontvanger kan onder meer voortkomen uit wettelijke bepalingen (MIRT-procedures, MER, etc.). Wij beschouwen kennis*overdracht* als succesvol wanneer het correspondeert met het tweede niveau van kennisutilisatie (*cognitie,* voorafgegaan door *ontvangst*) zoals gedefinieerd door Knott & Wildavsky (1980). De vijf niveaus boven *cognitie* geven een cumulatieve schaal voor wat wij bedoelen met kennis*doorwerking*. De schaal is cumulatief in de betekenis dat elk opeenvolgend niveau voortbouwt op de voorgaande: *verwijzing*, *inspanning, adoptie*, *implementatie*, tot uiteindelijk *impact*.

In een kennisinteractiemoment kunnen we de overdracht van K door S aan R observeren, en mogelijke belemmering daarvan diagnosticeren in termen van drie typen barrières: (1) transmissiebarrière, (2) cognitieve barrière en (3) psychologische barrière.

Het uitblijven van doorwerking van K diagnosticeren we in termen van zeven soorten faalmechanismen: (1) incorrect gebruik van K, (2) institutionele beperkingen, (3) hulpbron-gerelateerde beperkingen, (4) weglekken van K, (5) strategisch gebruik van K, (6) diskwalificatie van K door een derde partij, en (7) *no relay*, d.w.z. geen overdracht door R (nu als zender van K) aan een nieuwe ontvanger vanwege barrières in dit volgende kennisinteractiemoment.

Proof of concept

Om te beproeven of het raamwerk kennisinteractiemomenten zinvol laat framen observeren en diagnosticeren, hebben we het eerst toegepast op de historische casus: het ontwerpproces van het dijkversterkingsproject Kinderdijk – Schoonhovenseveer, een traject van 12 km. Langs deze dijk ligt veel lintbebouwing in of nabij de dijk. Om de overlast tijdens de uitvoering te verminderen heeft waterschap Rivierenland in de verkenningsfase van het project voor twee innovaties een praktijkproef uitgevoerd. We hebben in deze casus gekeken hoe de kennisoverdracht is verlopen tussen (1) het projectteam en de subsidieverlener, (2) het projectteam en de burgers, en (3) het projectteam en de aannemers van de innovaties. Deze ex-post toepassing heeft ons in staat gesteld om het raamwerk en de werkwijze verder aan te scherpen.

Praktijktoepassing

De volgende stap bestond uit toepassing van het raamwerk in een lopend project: de dijkversterking tussen Gorinchem en Waardenburg (GoWa). Hier moet de dijk over de volledige 23 kilometer versterkt worden. Naast drie gemeenten en twee provincies zijn ook bedrijven, bewoners en belangenorganisaties bij dit project betrokken. We hebben gedurende drie jaar meegelopen met het projectteam, tot het moment dat het

voorkeursalternatief door het waterschap formeel werd vastgesteld. Daarbij hadden we toegang tot alle bijeenkomsten en relevante documenten. Het projectteam wilde graag dat we meekeken bij het intensieve burgerparticipatieproces, waar ruim 100 actieve bewoners aan deelnamen. Gedurende onze betrokkenheid is er een nieuw projectteam gevormd, bestaande uit medewerkers van drie aannemers en een adviesbureau en het waterschap, doordat waterschap Rivierenland heeft gekozen voor een alliantie als samenwerkingsvorm.

We hebben gebruik gemaakt van de 'actieonderzoek-spiraal'. Elke bijeenkomst die we bijwoonden vormde een iteratie, waarin *plan*, *act & observe* en *reflect* activiteiten elkaar opvolgen: de projectteamleden plannen een volgende bijeenkomst en zaten deze veelal voor, terwijl de onderzoeker direct en/of door middel van vragenlijsten observeerde. Het FODIKI raamwerk hebben we gebruikt om gezamenlijk na te denken over de effectiviteit van de bijeenkomst, over de vraag welke exogene factoren en sociale mechanismen de observaties zouden kunnen verklaren, en over mogelijke aanpassing van de opzet teneinde de kennisoverdracht en -doorwerking in volgende bijeenkomsten te verbeteren.

In de periode december 2015 – november 2018 heeft de onderzoeker volgens een transparant protocol het actieonderzoek uitgevoerd. In eerste instantie had zij alle ruimte om te interveniëren en bij te dragen aan het procesontwerp. Waar mogelijk zijn bijeenkomsten opgezet als quasi-experiment, gericht op het testen van specifieke, vooraf door de onderzoeker samen met het projectteam opgestelde, proposities over de effectiviteit van specifieke interventies. Wanneer draaiboeken beschikbaar waren, heeft de onderzoeker vooraf een hypothese opgesteld welke barrières en faalmechanismen zouden kunnen optreden, en deze soms wel en soms niet met projectteamleden gecommuniceerd. Daarnaast heeft zij tijdens bijeenkomsten, op basis van observaties, in real time haar diagnoses gedeeld met projectteamleden om aan te geven waar de kennisoverdracht haperde, zodat zij daarop konden handelen.

Na de start van de alliantie, Q3 2017, veranderde door de komst van nieuwe alliantiecollega's haar positie binnen het team waardoor ze minder gemakkelijk kon interveniëren. Toen gaandeweg het vertrouwen in de onderzoeker groeide, kreeg ze weer meer mogelijkheden om kennisoverdracht en -doorwerking te verbeteren.

In totaal hebben we meer dan 130 kennisinteractiemomenten geanalyseerd. Daarbij is het raamwerk geconvergeerd tot het FODIKI-raamwerk zoals hierboven beschreven. In de interactiemomenten bleek dat vertrouwen indirect was te observeren via attitude en gedrag, en ook door middel van enquêtes die werden verspreid bij de informatiebijeenkomsten (gemiddelde respons ca. 65%). Bij de kennisinteractiemomenten tussen projectteam en burgers traden in 9 van de 10 gevallen één of meerdere *cognitieve* barrières op; de *psychologische* barrière daarentegen slechts zelden. In de kennisoverdracht tussen projectteam en overheden zagen we juist wel psychologische barrières. Dit kwam doordat van de overheden, vanwege het door het projectteam ingezette burgerparticipatieproces, werd gevraagd anders te handelen dan ze tot dan toe gewend waren. Doordat het projectteam er niet in slaagde om die nieuwe rol te verduidelijken, sloot het interactieproces tussen publiek en overheden minder aan bij de verwachtingen van het publiek. De *transmissie*barrière trad het minst op, en was meestal te wijten aan problemen met apparatuur of presentatievaardigheden van de

sprekers. Van de faalmechanismen kwamen *diskwalificatie* en *no relay* het meest voor, zeker in de interactie tussen projectteam en publiek. Tussen de professionals zagen we relatief vaak *weglekken* en *hulpbron-gerelateerde beperkingen* optreden. Verder zagen we dat als R feedback geeft aan S en duidt wat hij nodig heeft, veel barrières kunnen worden geslecht. We zagen ook dat vertrouwen opgebouwd kan worden gedurende het proces.

De GoWa casus heeft een aantal belangrijke inzichten opgeleverd: er is veel te winnen door bij het ex ante procesontwerp van een bijeenkomst zorgvuldig na te denken over de kennisbehoefte van de beoogde ontvanger en over de beoogde boodschap, en over hoe deze goed te laten aansluiten bij de taal en het jargon van de ontvanger en het behouden en uitbouwen van vertrouwen, zowel tussen S en R onderling als in de over te dragen K. Omdat het kennisoverdrachtsproces uit (soms parallelle) ketens met veel schakels bestaat, is het zaak dat bij het plannen van ontwerpprocessen ook deze ketens bewust ontworpen worden. In aanloop naar de formele beslismomenten die de faseovergangen in een MIRT-project markeren, maar ook naar cruciale bijeenkomsten van de informele instituties (KBG, ABG, BBG) moeten procesmanagers anticiperen op de kennisbehoefte van partijen, en deze partijen bewust maken van de rol die zij spelen in de schakels van een kennisketen.

Mogelijke interventies en overdraagbaarheid van de methode

In dit onderzoek onderscheiden we drie interventiecategorieën om kennisoverdracht en -doorwerking te verbeteren: (1) kennismanagement, (2) procesmanagement, en (3) sturing in het beleidsnetwerk. In de interactiemomenten waar we hebben geïntervenieerd ging het vooral om kennismanagementinterventies om cognitieve barrières te slechten. In enkele gevallen betrof het procesmanagementinterventies om faalmechanismen te mitigeren. Het observeren tijdens interactiemomenten en diagnosticeren van de eventuele barrières en faalmechanismen bleek minstens zo belangrijk als het plegen van een interventie voor het verbeteren van de kennisoverdracht en - doorwerking.

Het FODIKI raamwerk breidt het algemeen aanvaarde conduitmodel uit door andere elementen uit de wetenschappelijke literatuur op een semantisch verantwoorde manier te integreren. De concepten zijn voldoende operationeel om geobserveerd te worden, zodat aan de voorwaarde van construct-validiteit is voldaan. Dit stelde de onderzoeker in staat om een consistente betekenis te geven aan haar observaties. Zij heeft haar diagnose altijd geverifieerd bij belanghebbenden, is actief op zoek gegaan naar feedback en kritiek, en daarnaar gehandeld. In de loop van het onderzoek is het gebruik van het raamwerk verschoven van ex-post diagnose naar diagnose en (in) directe interventies in real-time. In de GoWa-casus heeft de onderzoeker de sociale mechanismen verfijnd door de uitleg ervan en de manier waarop ze in real-time kunnen worden waargenomen in detail uit te werken, maar de typen mechanismen zijn hetzelfde gebleven, met behoud van de semantische samenhang. Het raamwerk lijkt robuust en biedt observatie en diagnose van de waargenomen interactiemomenten, wat betekent dat aan de voorwaarde van interne validiteit wordt voldaan.

Externe validiteit houdt in dat de bevindingen generaliseerbaar zijn in verschillende situaties. De analyse-eenheid van het FODIKI-raamwerk was één enkel kennisinteractiemoment, en hoewel we slechts één live case onderzochten, analyseerden we meer dan 130 kennisinteractiemomenten. De GoWa-casus is representatief voor projecten binnen het Nederlandse hoogwaterbeschermingsdomein, omdat deze de MIRT-aanpak volgt en qua complexiteit een mainstream project is binnen het HWBP.

De externe validiteit wordt ook bepaald door de overdraagbaarheid van de FODIKI-methodologie aan anderen, zodat zij de ODI kunnen gebruiken voor kennisoverdracht en -doorwerking. Binnen de GoWa casus hebben we dat proefondervindelijk via een meester-gezel constructie vormgegeven. Gedurende twee jaar is de onderzoeker opgetreden als expert in het overdragen van de methode op projectniveau. De onderzoeker heeft daarbij het raamwerk toegepast bij het analyseren van haar eigen acties op het gebied van kennisoverdracht en -adoptie. In een intervisietraject heeft de onderzoeker handvatten geboden om tijdens bijeenkomsten observaties te doen, die te diagnosticeren, en naar bevind van zaken te handelen. Na twee jaar is de FODIKI-methodologie aan drie medewerkers, werkzaam op het gebied van omgevingsmanagement, overgedragen en passen ze het nog dagelijks toe. Belangrijke voorwaarden voor een snelle adoptie door de gezel zijn een open houding van de gezel, en diens vermogen om nieuwe werkwijzen te verinnerlijken. De onderzoeker heeft, zowel op waterschapsniveau als op HWBP niveau, intervisietrajecten uitgevoerd. De verdraagbaarheid van de FODIKI-methodiek bleek moeilijker, omdat deze ook afhankelijk is van de absorptiecapaciteit van de betrokken organisaties. De onderzoeker is er slechts ten dele in geslaagd om het belang van kennisoverdracht en -opname onder de aandacht te brengen, waardoor de doorwerking beperkt bleef tot het niveau van *cognitie* (op HWBP niveau) en *inspanning* (op waterschapsniveau).

Uitgangspunt van onderzoek is geweest dat kennisoverdracht in een keten van interacties tussen personen plaatsvindt. Onze observaties laten zien dat kennisoverdracht inderdaad plaatsvindt op het elementaire niveau tussen zender en ontvanger, en dat de schakels in een kennisoverdrachtproces ontwerpbaar zijn, zij het binnen de grenzen die de politieke context onvermijdelijk zal stellen aan de interventies. Voor toepassing van FODIKI binnen projecten is onze aanbeveling steeds te focussen op een reeks van kennisinteracties, die te ontwerpen met oog voor de variabelen uit het raamwerk, en daarbij bewust te blijven dat aandacht voor kennisoverdracht en -doorwerking op dit moment nog niet vanzelfsprekend is voor de stakeholders bij dijkversterkingsprojecten. Om dit te veranderen zou zowel binnen waterschappen als op programmaniveau een institutioneel kader ontwikkeld moeten worden dat vorm geeft en eisen stelt aan permanente processen gericht op leren over projecten heen.

Vanuit wetenschappelijk oogpunt verdient het de aanbeveling de drijfveren die de behoefte van een ontvanger beïnvloeden systematischer te duiden. In dit onderzoek was de onderzoeker in staat om deze te destilleren, mede door haar jarenlange ervaring, maar het raamwerk biedt hiervoor nog geen handvatten. Verder bleek dat de psychologische barrière in de praktijk lastig is te identificeren, en vraagt om een systematischere duiding. Tot slot hebben we gezien dat de uitdagingen op het gebied van kennismanagement en organisatiemanagement, zoals de dynamiek, schaal- en tijdseffecten, discontinuïteit en context, onverminderd van toepassing zijn binnen het domein van waterveiligheid.

1 Introduction

In this first chapter, we will argue that knowledge transfer is crucial for developing flood risk management strategies, but also difficult due to technical, institutional and societal complexity. We contend that to enhance the knowledge transfer and uptake, a policy analyst/process designer must be able to detect and diagnose knowledge transfer situations, and foresee the consequences of possible interventions. To this end, we outline an action research approach that could improve our understanding of the possible determinants of success (in terms of utilization) of knowledge transfer, and in the types of useful interventions.

1.1 Flood risk management in the Netherlands

The Netherlands is located in the lowest delta in the world: approximately 25% of the country lies below sea level. The famous saying 'God created the world, and the Dutch created the Netherlands' (Saeijs, 1991) refers to the many interventions of the Dutch in their landscape. Without the extensive system of dikes, dams and dunes and other hydraulic structures, 65% of the country would be vulnerable to floods coming from the sea and the rivers. Flood risks are mitigated by building and maintaining flood defences and other waterworks to regulate the water. To ensure that construction, maintenance and overhauls take place and are adequately funded, flood risk management (FRM) and water management are integrated, both in approach and in the people involved. The effectiveness of this organization depends as much on solid dikes as it does on strong institutions and a solid knowledge base.

The Netherlands and its water management institutions and know-how have co-evolved over time. By the end of the 13th century, the Dutch shifted from a strategy of accommodating water, in which people lived on dwelling mounds, to a strategy of protecting land (Van Koningsveld *et al.*, 2008). In the centuries that followed, more and more land was reclaimed and protected by dikes, typically designed at the highest known storm surge plus one meter additional freeboard (Vrijling, 2001). By the year 1600, 19 lakes had been drained to reclaim 27 km^2 of land in the region north of Amsterdam (Hoeksema, 2007). This practice continued on a gradually increasing scale (Lake Beemster in 1612: 77 km^2, Lake Haarlem in 1852: 180 km^2) until the start of the 20th century. Then two major flood incidents led to changes in the Dutch flood risk management approach.

The first storm surge of 14 February 1916, combined with the food shortage during World War I, triggered the effectuation of Plan Lely to dam the *Zuiderzee* in the Netherlands. A 32 km dam, the *Afsluitdijk*, shortened the coastline by 300 km, creating a 1200 km^2 freshwater lake, and allowing 2200 km^2 of land reclamation (Van Koningsveld *et al.*, 2008). The Plan Lely marked a shift from craft-based local dike construction to using a science-based model for designing dikes on a national scale. The mathematical model for tidal calculations developed by Lorentz became a standard tool for Dutch engineers, technicians and scientists involved in dike design and construction projects (Disco & Van de Ende, 2003).

The second flooding happened early 1953, when a north-western storm and spring tide caused a disaster in the south-western part of the Netherlands. In the aftermath of this flood, the first Delta commission was installed to draw up a Delta Plan: a plan to reinforce

the dikes, and to shorten the length of the coastal defence line by closing off many of the existing estuaries with dams. Only two estuaries were to stay open: the Western Scheldt, which leads to the Port of Antwerp, and the New Waterway, which is the entrance for the Port of Rotterdam. Along these two estuaries, the dikes had to be strengthened to reach a so-called Delta Level, roughly that of the summer flood tide of Amsterdam when it was open to the sea. The Delta Plan was again a big leap, not only in scale, but also in applied scientific research. Moreover, central government initiated the development of technical safety standards. Based on the available knowledge, a statistical approach was chosen to calculate storm surge levels, and after further research the Delta Committee considered design water levels with exceedance frequencies of 1 in 10,000 year (for the Dutch coastal area), and 1 in a 1,250 year (for the Dutch river area). This standard was, however, not legally binding.

A new wake-up call came in 1993, when both the rivers Rhine and Meuse had high discharges, with return periods in between 50 years and 100 years. Lacking effective flood protection, the Meuse valley filled up, and the river flooded a number of towns and villages, affecting 8 thousand people. In 1995, the discharges were even higher, and saturation of the Rhine dikes at Ochten near Nijmegen induced a preventive evacuation of 250 thousand people from polders in the triangle Arnhem–Nijmegen–Gorinchem. These events created a window of opportunity for formalizing safety standards in legislation, first in the Act on Flood Defences (1996) and later in the Flood Protection Act (2009).

Today, all Dutch flood protection structures are to be assessed every 12 years against statutory technical safety standards, using *state-of-the-art* knowledge. Thus, design principles and methods for testing compliance with standards will be updated regularly, based on gained experiences and new insights from scientific research. Although this sounds sensible, practice shows that this uptake of new knowledge is often problematic.

1.2 Impact of new knowledge on FRM policy

The Dutch dikes along major rivers are designed to withstand peak loads caused by surges of meltwater and rainwater. After a flooding in 1926, the dikes along the Rhine branches were strengthened to withstand the highest known discharge to that point in history: 12,500 m^3/s at Lobith. In the fifties, the first Delta committee estimated (based on statistical analysis of time series) that the design discharge of 18,000 m^3/s at Lobith could be considered as safe (Voorendt, 2015), and that the design level corresponded with an average exceedance frequency of 1/3,000 per year (Algera, 1956; RIVM, 2004; Van Heezik, 2008). In the period that followed, several committees were asked to evaluate this design discharge using state-of-the-art data and methods. This led to several modifications: in the seventies, the design discharge was lowered to 16,500 m^3/s, with a corresponding average exceeding frequency of 1/1,250 per year, and in the early nineties even further, to 15,000 m^3/s. These lower design discharges were adopted mainly to reduce dike reinforcements and preserve LNC-values. New knowledge and the near-flooding events in 1993 and 1995 led to a design discharge norm also for the Meuse branches. In 2001, the peak discharge was increased to 16,000 m^3/s on the basis of analysis of (ever longer) time series. The second Delta committee increased the peak discharge to 18,000 m^3/s due to the climate scenarios (Deltaprogramme, 2015).

This brief history shows that methods and insights have changed over time with strong policy consequences. Because FRM science and technology is institutionally embedded, such changes are problematic. Since (a) the maximum water levels for all the Dutch rivers are estimated using calculations based on the Lobith peak discharge, while (b) formal statutory standards state that a dike has to be strengthened if these calculations show that it cannot withstand the estimated maximum water level, it follows that (c) changing a key number such as the Lobith peak discharge can dramatically change the cost of FRM policy implementation.

The same holds for changes in statutory standards for constructive elements used in dike design. In *Handreiking Constructief Ontwerpen* (one of a series of policy documents guiding the design and testing of flood defences against the statutory norms laid down in the Flood Protection Act), the Dutch Ministry of Infrastructure and Environment prescribes a detailed procedure for designing sheet pile walls. Until recently, this prescribed an additional surcharge for corrosion. When the second Dutch Flood Protection Programme initiated a research project to investigate the rate of corrosion, field experiments showed that the corrosion of the sheet piles took place at a slower pace than expected. This allowed lowering the surcharge, affording thinner sheet piles, and hence reduced the cost of reconstruction of flood defences.

Current research focusses on sheet piles made of other materials than steel, which could further reduce construction costs. However, regional water authorities are apprehensive of using new methods and materials. After all, the flood defences have to hold during extreme conditions, and failure of a flood defence has severe consequences. New innovative technologies should therefore be validated before they are implemented in policy. This apparently plain and sensible principle is not simple to implement (Tromp *et al.*, 2016).

In the nineties, a desktop study on the safety of Dutch dikes showed that 'piping' dominates in terms of failure probabilities compared to other failure mechanisms. 'However, the estimated failure probabilities determined by Sellmeijer's mathematical rule led field experts in the Netherlands to question whether piping will actually lead to failure of certain flood defences' (Van Beek *et al.*, 2011). In the same period, several dike failures in the U.S., China and the Netherlands were attributed to this mechanism. The Ministry of Infrastructure and Environment therefore initiated the comprehensive research programme *Sterkte en Belastingen Waterkeringen* (Strength and Loading of Flood defence structures) that should improve the periodic safety assessment of Dutch flood defences. This programme included a sub-programme on piping that should validate, and if possible, improve, the model of Sellmeijer. A series of small-scale, medium-scale, centrifuge, and full-scale experiments were carried out. The research validated Sellmeijer's rule with small adjustments, and confirmed that dike failure is possible through piping.

Although shown to be valid, adopting Sellmeijer's rule as state-of-the-art knowledge would mean that a high percentage of the Dutch flood defences would fail to pass the statutory assessments. This made the Ministry decide that the consequences of the new insights regarding the piping mechanism should be assessed first. Pending this research, the Ministry did not share these insights with the regional water authorities, whereas the other results from the SBW programme were to be used by the RWAs (Min I&M, 2013).

However, not using available knowledge can also have consequences. When municipality de *Ronde Venen* sued the RWA *Amstel Gooi en Vecht* for the damages caused by the levee breach in Wilnis, the court ruled that public bodies must use the current state of knowledge in the performance of their primary tasks (Hoge Raad, 2010). For the RWAs, this ruling meant that they must apply knowledge about failure mechanisms, or they can be held liable for damages. The RWAs therefore requested access to the research reports. In response, the Ministry developed a formal guideline (*Werkwijzer Piping*) to indicate how in the intermediate period the RWAs should deal with the piping failure mechanism. This solution bought extra time to analyse the possible consequences and to check if the developed rules were correct. Presently, the regional water authorities and the Ministry are conducting joint research within the Dutch Flood Protection Programme (DFPP) to find optimization opportunities to lower the possible societal and financial impact of this specific failure mechanism.

1.3 Multi-functionality and competing values

Our examples illustrate that FRM knowledge and policy are intricately linked, and that the Dutch policy response to new insights is to jointly develop procedures for assessing safety and reliability and balancing these values against affordability. Because flood defences also serve other functions, FRM requires a trade-off between many more values. The Delta Plan aimed not only to protect the Netherlands from flooding, but also to improve water management in many parts of the country, reduce salt intrusion, and create freshwater reservoirs and new recreational areas, while the new dams would greatly improve road access to the southwest Netherlands.

The original plan of the Delta works was to close off the Eastern Scheldt by a dam. However, during the execution of the Delta works, several ecological problems occurred, including eutrophication, habitat loss and disrupted sediment balance (Van Wesenbeeck *et al.*, 2014). In Dutch society, the perspectives changed, leading to more interest in nature conservation and a so-called 'ecological modernization' (Mol, 1999). The pressure of the public opinion became so fierce that the Dutch government initiated new studies to investigate if an open Eastern Scheldt was technically viable. These studies showed that it was possible to protect the province Zeeland while preserving the existing habitat by means of a storm surge barrier with movable gates. Part of the Delta works was The *Hollandse IJsselkering,* built in 1958, which was the first movable storm surge barrier in the Netherlands, ensuring the ship movements throughout the year, as the barrier only closes in times of expected high water levels.

The decision to construct the *Oosterscheldekering* hallmarks the inclusion of ecological values in FRM policy (Disco, 2002). Similarly, the construction in the 1990's of the *Maeslantkering*, another strikingly innovative movable storm surge barrier, illustrates the inclusion of cultural historical values, as the alternative option for safeguarding the river delta against flooding while preserving access to the Port of Rotterdam (upgrading the dikes along the New Waterway) would have required demolition of historic town centres. The development of these large-scale innovative flood defences not only incorporated more values, it also mobilized a wider range of scientific disciplines to providing the necessary knowledge base (Van der Brugge *et al.*, 2005; Van Stokkom *et al.*, 2005; Wiering & Arts, 2006).

The successful integration of these disciplines in national flood protection projects inspired to design for the multifunctional use of flood defences on smaller scales. While designing and constructing flood defences, a range of functions can be added, including transport (roads and cycling paths on and along a dike), housing (houses in/on the slope; apartment buildings integrated in a flood defence system), agriculture (grass-covered slopes for sheep to graze), nature (flowers beds providing a habitat for insects), and energy provision (wind turbines and solar panels on and along a dike). An early example of a successful local project is the reconstruction of the boulevard of Vlissingen in 1995. The province of Zeeland wanted to ensure the recreational use of this boulevard to help hotels and restaurants maintain their business activities, thus adding economic and recreational values to the project.

During the design process, the regional water authority Zeeuwse Eilanden worked in close cooperation with the municipality of Vlissingen, the province of Zeeland, and local entrepreneurs. The different interests could be incorporated in an adaptive flood defence design: anticipating a future need for elevating the boulevard, the architecture of new seaside residential apartment buildings oversized the floor-to-ceiling space of the ground floor, affording convertible uses that would accommodate future elevation of the primary flood defence and boulevard. To ensure that the commercial interests would not block future elevation, the regional governmental parties incorporated the adaptive flood protection measures in all relevant policy and legislation documents (Tromp *et al.*, 2012).

More recently, when a study by Rijkswaterstaat (the executive agency of the Ministry of Infrastructure and Environment) indicated that the impact of the waves on the Dutch coast was much greater than originally assumed, the village of Katwijk was found to be a 'weak link' in the Dutch coast line (DFPP2, 2011). Part of the village lies outside the flood defence, and was hence not protected, while the defence was too low to deal with severe storms. Raising it would have meant the demolition of several buildings, changing the historical character of Katwijk. Therefore, the decision was made to construct a new flood defence right on the seashore: a row of dunes incorporating a reinforcing dike. This concept had only been applied at one other location, Noordwijk, along the Dutch coast, with similar conditions.

As on sunny days, Katwijk and its beach attract a host of visitors who park their cars along the boulevard, obstructing the sea view, the municipality saw the opportunity for combining the flood defence with an underground parking garage. At first, the regional water authority Rijnland was reluctant to combine these two functions, but after several rounds of analysis and policy deliberation, it appeared that the dike-in-dune defence would provide the best solution, offering both flood safety and parking space, while maintaining the spatial quality. The technical design weighed all relevant interests from the governmental organizations. Along the development of the design, several technical hurdles had to be taken, in close cooperation with the subsidizers (DFPP-2 and Province). The RWA, the municipality and the residents of Katwijk opted for a broad, low dike so that the highly valued sea view would be preserved. The result was the construction of a wide row of dunes in front of the dike to break the action of the waves (Voorendt, 2017). To create the required extra spaces, the beach was moved 100 metres towards the sea, resulting in the reclamation of new land. The dike was then covered in sand; the parking garage was built against this dike, and hidden under the new line of dunes.

The examples of Vlissingen and Katwijk illustrate a trend of increasing integration between spatial planning and flood risk management. Recent changes in acts and policies, notably the Water Governance Agreement (*Bestuursakkoord Water*), have strengthened the position of the Dutch water authorities in spatial planning processes and related governmental decision-making. On the one hand, the water authorities have more policy instruments, notably the 'water test' (*Watertoets*) and legal constructs such as double zoning, soil policy, and preferential rights, to defend and safeguard the interests of water management in spatial development projects (Van Buuren *et al.*, 2010). On the other hand, municipalities now have more responsibility for the urban water system. Their urban development plans have to be in line with the regional water management plans, drawn up by the water authorities.

This trend is likely to continue in the coming years (DFPP, 2014a, 2014b; Delta programme, 2014). The Environmental Planning Act (planned for 2021) aims to enable development and local initiatives by citizens and entrepreneurs, while safeguarding a high-quality environment. The act will replace around 30 existing acts to enhance the integration of regional plans, coupling more functions as well as the related scientific disciplines.

1.4 Research objective and questions

The examples in the preceding sections have shown that the use of knowledge in FRM policy is crucial and yet problematic. Different actors having different roles and responsibilities are resource-dependent on other actors (Ulrich & Barney, 1984) in various ways:

- Policymakers develop flood risk management policies and set statutory standards, so they need state-of-the-art knowledge, but this knowledge could become 'inconvenient truth' because of large financial consequences.
- Researchers can produce new knowledge, and often are pressed by policymakers, but the production of knowledge typically has a longer time horizon than policy decision processes, and results are uncertain or inconclusive.
- Policy implementers must meet statutory standards, but also have the formal responsibility to improve the flood defence structures, with only limited resources available.
- Dike designers wish to innovate, but have to deal with the stringent design principles linked to the statutory norms.
- The general public wants to be safeguarded against possible flooding, but also against hindrance and damage to their property.

Nonaka & Takeuchi (1995) argue that the effectiveness of knowledge has to do with how creation of new knowledge and transfer of existing knowledge are organised. The transition from mono-functional to multifunctional flood defences complicates such organization: more actors, more scientific disciplines, and more competing values. To be able to determine the extent to which these processes run well and, where possible, make interventions to improve them, we must understand how these processes take place.

The objective of this research is therefore to *gain a better understanding of how (creation), transfer and uptake of knowledge takes place in practice in design processes of (multifunctional) flood defences, and ultimately how interventions can improve the transfer and uptake of knowledge in the design processes.* To reach this objective, we have sought to answer the following questions:

1. Which factors may explain knowledge transfer and uptake (or lack thereof) in the design process of multifunctional flood defences?
2. How can these potential determinants for knowledge transfer and uptake be observed in practice?
3. Does this observation allow diagnosis, i.e., plausible explanation of processes and outcomes?
4. Which interventions can improve knowledge transfer and uptake in design processes of multifunctional flood defences?

1.5 Research approach

We have addressed these questions in a series of steps that combine principles from case study research (Yin, 2003, 2011, 2014) and action research (Carr & Kemmis, 1986; Kemmis, 2001; McKay & Marshall, 2001).

Our first step was to conceptualise knowledge transfer and uptake, and identify the determinants for their effectiveness, on the basis of an extensive literature review. This initial theory-based framework provided the starting point for further conceptualisation of knowledge transfer and uptake processes.

The next step was to further develop and validate the conceptual framework by applying it as a lens to a completed dike strengthening project to identify possible determinants, while keeping a keen eye for what Yin (2011) calls *construct validity,* and ensuring that our concepts were sufficiently operational to observe them. We investigated a variety of interaction moments and assessed their knowledge transfer effectiveness. In an iterative process, we categorised and generalised our observations, and gradually enriched the framework with a taxonomy of exogenous factors and social mechanisms. To increase construct validity, we typically used triangulation (Yin, 2003) by collecting data from multiple sources (documents, direct observation, and interviews), tried to establish a chain of evidence by looking at interaction moments that differing in scope and timescale, and asked stakeholders to review our analysis

The third step was to demonstrate the *external validity* of the framework by applying it in the context of a 'live' flood defence design process between Gorinchem and Waardenburg (GoWa) in The Netherlands, following an action research approach. Action research is characterised by 'the active and deliberate self-involvement of the researcher in the context of her investigation' (McKay & Marshall, 2001:49). It is an iterative process involving researchers and practitioners acting together on a particular cycle of activities, including problem diagnosis, action intervention, and reflective learning (Carr & Kemmis, 1986; Kemmis, 2001). Figure 1.1 (after Kemmis & Taggart, 2005) represents our approach with four activities: *plan, act & observe, reflect* and then *re-plan.*

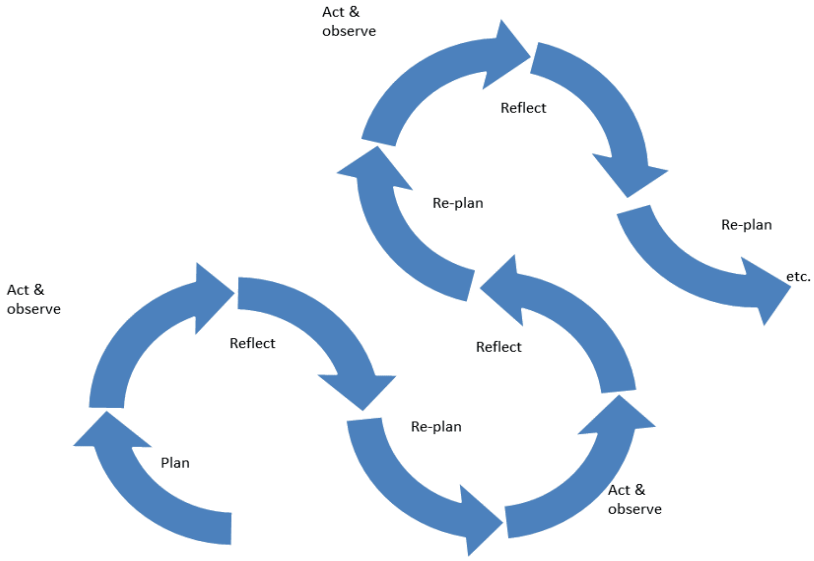


Figure 1.1: Action research spiral (after Kemmis & McTaggart 2005)

Following this approach, we sought to understand and improve (multilateral) knowledge transfer and uptake between participants in the design process of GoWa led by the RWA Rivierenland (Tromp & Bots, 2018). Each meeting that we attended formed an iteration through the action research cycle: RWA staff would plan for the next meeting, and then chair this meeting while we observed directly and/or by means of questionnaires. Afterwards, we used our conceptual framework to jointly reflect on the effectiveness of the meeting, on what exogenous factors and social mechanisms might explain the observations, and on how to revise the set-up to improve the knowledge transfer and uptake in future meetings. Whenever possible, meetings were designed as quasi-experiments aimed at testing specific propositions that we formulated ex ante with the RWA regarding the effectiveness of specific changes.

The action research constituted a learning-by-doing trajectory for both parties, because throughout the process we developed our method further, and gradually developed a 'toolkit' for observation, diagnosis and intervention. Although much entwined with the previous step, we consider the process of consolidating and documenting this 'toolkit' as the fourth step in our approach.

As we concur with Blichfeldt & Andersen (2006) that action researchers have the obligation to discuss transferability of their findings, we also considered the transferability of the conceptual framework and associated way of working to enhance knowledge transfer and uptake. This prompts a fifth research question: does the method work, and does the action-oriented approach contribute to the development of the professional field? We investigated this by asking the practitioners with whom we collaborated (members of GoWa, the regional water authority Rivierenland, technical research projects within the Dutch Flood Protection Programme) about their 'user experience', in particular

whether they find that the framework helps them to be and become a better 'reflective practitioner', and that this ultimately enhances the effectiveness of knowledge transfer and uptake in flood defence design processes.

1.6 Outline of the thesis

The structure of this thesis largely reflects our research approach. In Chapter 2, we present the conceptual framework for analysis of interaction moments in which knowledge transfer and uptake is constructed. The framework is based on a literature review of relevant factors to observe knowledge transfer and uptake in the design process of multifunctional flood defences.

In Chapter 3, we apply the conceptual framework to the dike strengthening project Kinderdijk-Schoonhovenseveer. This historical case study is meant to deliver the 'proof of concept' for the conceptual framework, demonstrating that it affords identification of important determinants for knowledge transfer and uptake.

We report the findings from our application of the framework in the 'live' project of dike strengthening in Gorinchem – Waardenburg in two steps. In Chapter 4, we report our findings from a wider range of interaction moments, seeking to understand how knowledge transfer and uptake takes place and whether real time diagnosis is possible. In Chapter 5, we then focus on the effectiveness of possible interventions to enhance knowledge transfer and uptake.

In Chapter 6, we evaluate the transferability of the knowledge developed during this dissertation to field practitioners within three scopes: a project scope, the scope of an organization, and the scope of a programme at national scale.

Finally, in Chapter 7, we discuss the applicability of the framework in the field of flood defences, and make recommendations for future research.

2 A framework for understanding knowledge transfer in flood defence design

In this second chapter, we argue that flood defence design, being embedded in processes of public policy making, has all the characteristics of a 'wicked problem', that this entails that actors must cooperate and share knowledge, and that this poses challenges related to power, uncertainty and divergent perceptions. We show that Dutch FRM institutions address these challenges by providing formal structures and incentives for cooperative interaction and consensual decision-making. We then argue that, because these institutions leave public actors considerable freedom to tailor processes to specific contexts, designing and managing such processes requires a capability for analysis and diagnosis of knowledge-sharing situations. We then present a conceptual framework that can help process designers and managers detect or anticipate problems, and find ways to improve knowledge transfer and uptake.

2.1 Designing Multifunctional Flood Defences: a 'wicked' problem

The examples in the first chapter show that designing multifunctional flood defences can be considered as a 'messy', 'unstructured' or 'wicked' problem (Rittel & Webber, 1973; Ackoff, 1979; Mason & Mitroff, 1981; De Bruijn, Ten Heuvelhof & In 't Veld, 2002; Hommes, 2008). Power (decision making authority, financial resources, knowledge) is distributed over a wide range of actors, while the division of responsibilities across public organisations, and between these organisations and the private sector, is not always crisp. Knowledge is situated in different disciplines (e.g., geology, geo-engineering, hydraulic engineering, ecology, transport, architecture, and spatial planning) that use different concepts and theories. The wealth of available information may hence be incomparable, incompatible of even contradictory, which gives rise to different types of uncertainty (Koppenjan & Klijn 2004). In addition, the involved actors differ in their norms and values: the Dutch water sector is territorially and institutionally fragmented, and stakeholders have distinct histories, cultures, and belief systems (Edelenbos & Teisman, 2013). To make good design decisions, hundreds of competing values – both tangible (monetary costs, infrastructure damage) and intangible (risk perception, aesthetics, social cohesion) – must be considered.

In 'messy' contexts, where power is distributed over decision-makers lacking consensus on both knowledge and values, public actors resort to horizontal forms of steering that aim for cooperation with other actors in a network of interdependencies (Hanf & Scharpf, 1978; Milward & Wamsley, 1985; Kaufman *et al.*, 1986; Powell & Brantley, 1992; Kickert *et al.*, 1997; Van Heffen *et al.*, 2000). Such cooperation will involve combination of diverse functions, policy areas, concerns, and resources (Weber & Khademian, 2008). Dealing with ill-structured problems not only requires 'stakeholder participation, but also understanding of the knowledge that is being shared and the knowledge that is being created' (Feldman & Khademian, 2005; Weber & Khademian, 2008). By consequence, effective transfer, uptake, and integration of knowledge across participants are crucial. However, knowledge processes at the science-policy interface are vulnerable along three dimensions (Tromp & Bots, 2016):

1. *Power* – Knowledge can be manipulated by those in power to justify decisions (Innerarity, 2013). In a field that is dominated by some actor (coalition), this actor can decide which experts to consult and what knowledge to accept. For the experts, this entails a 'speaking truth to power' situation (Wildavsky, 1989), while for the dominant actors, it entails that they can use knowledge selectively for political reasons. When power is polycentric, 'an expert may be highly appreciated by his/her client, but can be portrayed as a hired gun by his/her client's opponents' (Mayer *et al.*, 2004). Scientific controversies can therefore add fuel to political disputes. Conversely, different actors seeking to form a dominant coalition can choose to ignore scientific facts blocking compromise, heightening the risk of 'negotiated nonsense' (Van de Riet, 2003).
2. *Uncertainty* – Koppenjan & Klijn (2004) distinguish three types of uncertainty: substantive, strategic, and institutional. Substantive decisions require crisp criteria, whereas scientists typically give bandwidths. Policymakers find it difficult to act upon such uncertain knowledge (Funtowicz & Ravetz, 1990). Strategic uncertainty occurs when other actors' positions and actions are unpredictable, while institutional uncertainty occurs when actors cannot foresee to what extent new knowledge can be accommodated in formal regulations and deeply-rooted routines. Weiss (1998, 1979) and Nutley (2003) found that policymakers tend to disregard 'scientific findings unless these findings are non-controversial, and require limited change or do not upset the status quo' (i.e., low strategic and institutional uncertainty). Aarts & Van Woerkum (2002) show that stakeholders use different strategies in order to reduce uncertainty, e.g. 'they reconstruct or ignore information that is perceived as being threatening, constructing 'we' and 'they' identities, acting routinely starting from simple heuristics, and shifting responsibility'. However, the relation between uncertainty and knowledge uptake in policy is not straightforward. Policymakers may use uncertain scientific knowledge strategically to justify decisions, as the general public tends to readily accept and internalize uncertain information as long as it is consistent with current behaviours and beliefs (Bradshaw & Borchers, 2000).
3. *Misunderstanding* – Scientific controversies causing substantive uncertainty may originate from the discipline-oriented structure of scientific research, rather than from fundamental opposition of ideas. Brown & Duguid (1991) showed that expertise is situated; sharing it requires developing shared concepts. 'Frames of reference are actor-bound, and created through socialisation and experience' (Van Buuren *et al.*, 2004). Misunderstanding due to frame differences across actors often leads to standoffs in decision-making processes (Van Eeten, 1999). If parties have conflicting bodies of knowledge, this leads to controversy and conflict (Van Buuren, 2009). To prevent misunderstanding, or resolve controversies, parties need to negotiate some 'common ground' to relate knowledge to their respective disciplinary knowledge.

The literature on participatory water management (see Von Korff *et al.*, 2012 for an overview) offers various strategies to reduce these vulnerabilities. Participatory research (Barreteau *et al.*, 2010) interlaces scientific knowledge production and policy making. Participatory processes foster social learning to resolve misunderstanding and institutional uncertainty (Pahl-Wostl *et al.*, 2007; Pahl-Wostl, 2007). Joint fact-finding mitigates both the abuse of power and the risk of and 'negotiated nonsense' (Edelenbos *et al.*, 2011).

However, all participatory processes mentioned in the literature have limitations. A process designed for 'making sense together' (Hoppe, 1999) may lead actors to reach an effective compromise, but in a fragmented field with divergent core beliefs, actors may assemble into competing advocacy coalitions (Sabatier, 1988), and persist in a 'dialogue of the deaf' (Van Eeten, 1999). A process designed for 'power-free dialogue' (Habermas, 1984; Webler, 1995) in which information is shared, and consensus is reached through reasoned argument, rather than the exercise of power, may dissuade powerful actors to commit to its outcomes, or even to participate at all.

In sum, any process design aimed at enhancing knowledge utilization in policy decision making will remain sensitive to political, commercial, and even personal interests that may drive actors to agree on a plan on the basis of a conveniently incomplete appraisal, to delay a plan by indefinitely bringing up more criteria to be assessed, or other forms of strategic behaviour.

2.2 Institutions structuring FRM decision-making processes

Although not specifically developed for water management purposes, the Dutch spatial planning system provides instruments that address challenges associated with 'wicked' problems, in particular how to involve multiple organizations, professions, and a wide range of participants with contrasting knowledge needs, demands, and perspectives. Since the late 1990s, 'water' is put forward as one of the major structuring elements in Dutch 21st century spatial planning (Ministerie V&W, 2000). Since 2000, water management and spatial planning are coupled, laid down in both the Water Act and the Spatial Planning Act.

The Multi-Year Plan for Infrastructure, Spatial Planning and Transport (*Meerjaren-programma Infrastructuur, Ruimte en Transport – MIRT)* (MinIenWM, 2018) structures the flood defence projects. The MIRT approach is based on intensive cooperation between the central, local and regional authorities (provinces, municipalities, transport regions, regional water authorities), non-governmental organisations, and the private sector. Where challenges come together, they are jointly taken up by the involved stakeholders. These stakeholders explore possible solutions from a broad perspective, i.e., without zooming in directly on a particular solution from a single-issue perspective.

When a MIRT project starts, its initiator is responsible for the correct application of the formal rules that structure the MIRT approach. This approach typically organises long term spatial planning projects in four phases as depicted in Figure 2.1. The sequence and set-up of these project phases is geared to a 'funnelling' process that proceeds from generation of variety towards selection.

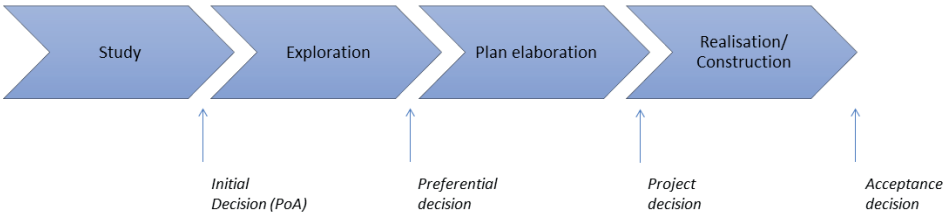


Figure 2.1: The four project phases of a MIRT project, including the decision at the end of each phase (Min I&M, 2016)

- In the Study phase, a project team writes a Plan of Approach (PoA; in Dutch: *Startnotitie*), that defines and explains the problem(s) central to the project, and the scope of the solution strategies. The PoA also describes which parties are involved, and how the tasks, roles, and responsibilities are assigned to the stakeholders. In the PoA, all substantive decisions are transformed into process-related agreements; the development of potentially feasible solution strategies, and the assessment of their impacts and required budget, are deferred to the next stage. The Study phase typically ends with the *Initial Decision* that affirms the agreements set out in the PoA. This decision constitutes the official starting point of a MIRT project.
- In the Exploration phase, the PoA serves as the base from which the initiator develops, together with the involved stakeholders, different solutions strategies. From time to time, in series of meetings, these parties develop and discuss potential smart solutions that take into account the collective ambitions as well as those of specific stakeholders. Throughout this development process, stakeholders observe the process-related agreements laid down in the PoA to which they committed themselves. Together with the involved stakeholders, the initiator develops a set of criteria to weigh the different solution strategies. This set of criteria is then applied to weigh all the different interests around the planned infrastructure, resulting in a preferential solution strategy. This phase ends when the competent authorities adopt the *Preferential Decision*: a well-substantiated choice for the preferred solution, the legal procedure, and the funding method.
- In the Plan Elaboration, the parties further substantiate the design in terms that are sufficiently concrete so as to tender the project. Tender procurement results in a much sharper estimate for the required budget, and paves the way for implementation of the final design in the next phase. When this phase moves to closure, all stakeholders are invited to formally submit their substantiated views to the competent authority. The phase officially ends when the *Project Decision* is ratified by the responsible Minister.
- During the Construction phase, the initiator of the project, together with the contractor who won the contract, timely inform the stakeholders about the construction planning and possible nuisance that may occur. At the end of this phase, the project is handed over to the formal asset manager. The phase formally ends with the *Acceptance Decision* by which the asset manager accepts the project deliverables.

At each formal decision moment that marks the end of a phase, the initiator must specify for the next phase the intended participation approach to a level of detail that

is appropriate for that phase. For all but the Study phase, the initiator must likewise provide adequate information on budget and funding for the project.

De Bruijn & Ten Heuvelhof (2002) define four generic principles for policy process design and management which state that a process should (1) remain open to include new issues and associated stakeholders, (2) protect the core values of stakeholders, (3) ensure the creation and use of substantive knowledge, and (4) provide incentives for progress that preserve the momentum of the decision-making process. The 'funnelling' approach prescribed by the MIRT framework meets these principles:

- *Openness*: At the end of each phase, a plan is derived for the next phase. In this plan, all relevant stakeholders are considered that should participate in the subsequent phase. In addition, all content decisions are transformed into process-related agreements, which ensures the openness of the process.
- *Progress*: Every phase ends with a political-administrative decision on a plan for the subsequent phase. When, at the close of the Study phase, the initial decision to start a MIRT project is taken, the subsequent phases are bound in time by the terms set out in the MIRT financing regime. These terms provide considerable incentives for progress, as the national investments in the MIRT are (mainly) financed by the Infrastructure Fund and the Delta Fund.
- *Substance:* The initiator ensures the creation and use of *substantive knowledge* as he works phase by phase to substantiate problems and solutions in increasingly concrete terms. The MIRT procedures prescribe for each phase how to 'interweave' process and content: at the end of each MIRT phase, the involved directors decide which solution strategies will be developed further, and how the various partners will contribute to this. Prior to this decision. the administrative partners must provide transparent decision information, notably including an assessment of the effects and costs of solutions based on a jointly defined set of criteria.
- *Protection of core values*: In each phase, stakeholder involvement is laid down explicitly in process agreements that permit stakeholders to articulate and defend their specific interests. Before the decision at the end of a phase can be taken, procedures are observed to guarantee that the decision to be taken is legitimate.

Although the MIRT framework defines for each phase the procedures, the nature of the decisions, and the requirements to be met to qualify for national (and regional) government investments, it still leaves considerable freedom to the initiator to tailor processes to specific contexts. At this more detailed process level, the formal MIRT institutions are complemented by *in*formal institutions that Rye *et al.* (2018) characterize as 'the lubricant between the formal legal definition, the powers and policies of an organisation and what it wants to do in practice'. In MIRT projects, the project team typically forms three informal procedural 'action arenas' (Ostrom *et al.*, 1994) that provide additional structure for interaction with stakeholders: the sounding board group (SBG), the administrative monitoring group (AMG) and the executive monitoring group (EMG):

(1) The project team forms the SBG early on by actively seeking out local stakeholder representatives that have a connection with the planned infrastructure, such as interest groups for recreational purposes, cultural heritage and community councils.

This ensures that all relevant parties are involved in the decision-making process. Although these representatives are not formally elected, they often act on behalf of a constituency. The SBG provides solicited and unsolicited advice, and can propose topics for consideration by the project team. Thus, they function as the 'ears and mouth' for the interest groups and local communities. The SBG is invited to give feedback on all formal documents, and the SBG chair also attends EMG meetings. Having access to project information as well as to the stakeholders they informally represent, and being able to bring their interests to the table of the EMG, the SBG contributes to both *openness* and *protection of core values.*

(2) The project team forms the AMG, which comprises representatives of regional governmental bodies. These members advise both the project team as well as the representatives of their own regional governmental body in the EMG. The involved co-governments have their own tasks and responsibilities that can be (partially) linked or coupled with the dike re-design, requiring the AMG members to coordinate the plans within their own organization. The AMG meetings are always attended by project team members to share and discuss information. The AMG is an efficient medium for sharing knowledge between the representatives, and forms an important interface between the administrative and executive level of the governmental bodies. The AMG members ensure that *substance* is sufficiently covered, point out the associated *core values*, and contribute to *progress* by indicating to the EMG when a window of opportunity appears to open.

(3) The project team also forms the EMG. Although here, too, there are no formal rules, the typical members of the EMG are the (elected) administrators (aldermen, provincial delegates, RWA board members, director Rijkswaterstaat) who are responsible for the project, given its scope. Within the EMG, its members coordinate administrative issues that are important for the competent authority they represent. The chairman of the SBG attends the EMG meetings to bring in other important issues. Since the formal decision-making remains with the formal institutions (e.g., municipal council, provincial council), the EMG members can commit to the process without committing to its outcome. This allows them to share more information with other EMG members without risk of overcommitting. The formal flow of information (the project team sending relevant documents to the secretary of the local councils to keep them updated of the latest project developments) is complemented by an informal flow of more politically sensitive information (via the EMG members). In this way, the EMG contributes to the principles of *substance, protection of core values,* and *progress.*

Having both an AMG and an EMG implements the process design principle that, to mitigate the risk of 'negotiated nonsense', the substantive analysis and political decision-making should be separated, but also entwined (De Bruijn & Ten Heuvelhof, 2002). During each MIRT phase, substantive issues are addressed in the AMG, while political and administrative issues are addressed in the EMG. As both groups are informal institutions, the coupling between substance and decision-making is loose. Only at the stage-gate moments at the end of each MIRT phase does this coupling become tight. At such moments, the responsibility is placed where it belongs in the Netherlands: with the elected representatives.

Substantive knowledge transfer is also structured by another formal institution: the Environmental Impact Assessment (EIA). For most projects, an EIA is compulsory. Within a MIRT project, the EIA is typically developed throughout the Exploration phase and the Plan elaboration phase. In flood risk management projects, the Province acts as the competent authority for the EIA, while the initiative for the EIA lies with the RWA. Part of the EIA procedure is that stakeholders are formally invited to submit their response to the competent authority. The draft EIA informs the executive board of the RWA in their decision on the preferred alternative for a project at the end of the Exploration phase. The formal EIA procedure still leaves degrees of freedom to the initiator. The project team uses this freedom judiciously. Depending on the project characteristics, the project team can decide not to develop an EIA, as we will see in Chapter 3, or to write a Report on Scope and Level of Detail (*Notitie Reikwijdte en Detailniveau*), as we will see in Chapter 4. This additional step helps to take the core values of the involved stakeholders into account, while working towards a stage-gate. Thus, in the existing procedures there is room for further (local) interpretation, giving way for lateral thinking.

In sum, the MIRT approach and its associated formal and informal institutions provide structures as well as incentives for cooperative interaction and consensual decision-making. Decision-making power is distributed among stakeholders, institutional uncertainty is reduced as at the start of each phase rules of the game are agreed, and transparency and openness of the process make it difficult for actors to adopt strategic behaviour. However, while funnelling through the MIRT approach, the process remains vulnerable to uncertainty and misunderstanding because stakeholders must share all kinds of knowledge (substantive, institutional, processual and procedural), whereas the MIRT approach leaves open how knowledge is shared and utilized.

Vlachos (1978) argued that in the context of ill-structured problem-solving processes, knowledge transfer from science to policy involves the development of a network of reciprocating relationships between knowledge suppliers and knowledge users. How stakeholders can develop stable chains of knowledge utilization embedded in long-lasting social influence networks is not clear. Most research in the field of knowledge management concerns knowledge sharing within and between organisations, predominantly in industry and the medical sector (Kothari, 2011; Paulin & Suneson, 2012; Carlile, 2002,2004). Literature on improving knowledge sharing in policy decision-making processes is relatively scant, and focuses on process designs to foster participation and social learning (Pahl-Wostl *et al.*, 2007; Pahl-Wostl, 2007), and evaluation of such processes (Beierle & Koninski, 2000; Rowe & Frewer, 2004, 2005). Although the relevance of designing these interactions is recognized (Bots, 2013; Von Korff *et al.*, 2010; Dionnet *et al.*, 2013), the elementary level of knowledge exchange in communicative interactions between participants in policy processes is not well developed.

2.3 Conceptual framework

Vlachos (1978), and likewise many researchers of knowledge management in organizations (Boland & Tenkasi, 1995; Szulanski, 2003; Lindsey, 2006; McKinnel Jacobson, 2006; Joshi *et al.*, 2007; Liyanage *et al.*, 2009), argue that to understand knowledge transfer processes, the interactions between individuals should be investigated as communication processes. The conceptual models they propose for doing this all have their roots in the transmission model of communication (Shannon & Weaver, 1949), later adapted to interpersonal communication by Berlo (1960), to mass communication by Schramm (1965) and McQuail & Windahl (1981), and often referred to as the 'conduit' metaphor (Reddy, 1979; Axley, 1984). These 'conduit models' of knowledge transfer have been critiqued for viewing knowledge as an objective entity (Hislop 2002; Butler 2006), but the conduit metaphor *per se* is not incompatible with a constructivist view of knowledge (Boland & Tenkasi, 1995; Joshi *et al.*, 2007)

Building on these ideas, we take a single knowledge interaction as the unit of analysis. During such an interaction, represented schematically in Figure 2.2, knowledge (K) is communicated by a sender (S) to a receiver (R). If a knowledge interaction succeeds, K is available to R, meaning that R can choose to use it.

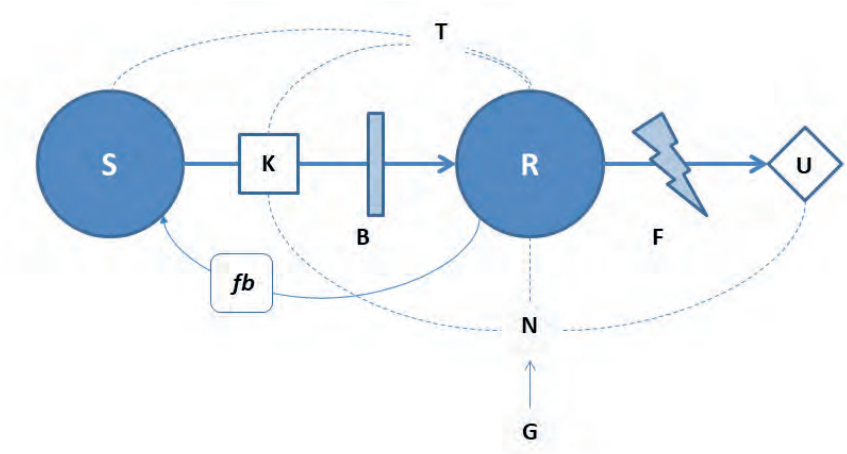


Figure 2.2: A sender-receiver framework for knowledge sharing and uptake

Our conceptualization modifies and extends Vlachos' (1978) original model in several ways:

- We emphasize – more strongly than Vlachos does – that knowledge is (socially) constructed, while maintaining the idea that knowledge can be communicated by a sender to a receiver.
- We have changed Vlachos' concept of 'knowledge adoption' to 'knowledge uptake' (U) to better express that R, having received and understood K, *acts* on this knowledge.
- We have added the concept of 'barriers' (B) that may impede knowledge transfer, because this is more in line with recent literature on knowledge management (Carlile,

2004; Lindsey, 2006; Berends *et al.*, 2011; Paulin & Suneson, 2012). This category includes Vlachos' four types of 'noise' on the channel between S and R (mechanical, semantic, epistemological and teleological noise), as well as his interpretation of 'cognitive dissonance'.

- We have added failure mechanisms (F) that may inhibit knowledge uptake. This category includes Vlachos' concept of 'structural strain'.
- We have re-introduced the concept of 'feedback' (*fb*) that DeFleur (1966) added to Shannon & Weaver's transmission model. Feedback in conduit models entails that S and R are aware of their roles and of the knowledge they have and lack (Carayannis, 1999). This 'meta-knowledge' also comprises S being aware of the receiver's need N. Through feedback, R communicates on the meta-level whether he understands the shared knowledge K, and point out barriers and failure mechanisms that (may) occur[1]. This then enables S to adapt.
- We have added preconditions related to the willingness of S to share K, to the knowledge need (N) of R stemming from grounds (G), and to trust (T).

In the remainder of this section, we will further elaborate the meaning of the key concepts and relationships depicted by Figure 2.2.

Knowledge

Knowledge can be defined simply as 'something that someone knows'. For Plato, knowledge (*episteme*) is different from opinion (*doxa*) because it is a justified true belief (Nonaka & Takeuchi, 1995), independent from context, whereas an opinion is a subjective belief that may be false. Aristotle makes a further distinction between *episteme, techne* and *phronesis,* as different 'virtues of thought' (Parry, 2014). *Techne* means craftsmanship, and encompasses the principles and methods involved in the production of an object or the accomplishment of an end. *Techne* resembles episteme in implying knowledge of principles, but differs in that its aim is making or doing. *Phronesis* refers to the ability to realize how a specific goal or value is reached. It includes appraisal of a situation, critical analytical reflection, and scrutinizing knowledge systems, practices, and impacts of goals. In other words, *phronesis* is about knowing why, when and where to apply *episteme* (know what) and *techne* (know how) of a specific domain to find the 'right answer' in a particular situation. The transfer and uptake processes for these types of knowledge will probably differ.

The idea of 'a person knowing something' entails that knowledge is situated (Brown & Duguid, 1991; Lave & Wenger, 1990; Wenger, 1998). Knowledge is a mental construction: concepts become meaningful only when they are considered in relation to each other. An individual needs to relate new knowledge in his mind with knowledge he already has. People understand a situation by comparing and combining it with their mental model of the world, while minimizing cognitive dissonance (Festinger, 1957). Weick (1995) characterizes this mental construction as *sensemaking*: a process by which people give meaning to a situation in response to the felt need to reduce the equivocality and ambiguity of the things they experience. This need can be seen as proportional to the experienced 'gap' between what people know and new information they receive.

1 We found it a remarkable coincidence that the two letters that form the symbol *fb* for feedback suggest that feedback from R may sensitize S to specific failure mechanisms *(f)* and/or barriers *(b)* that R foresees or experiences.

Knowledge has both a mental and a social construction. Polanyi (1966) argues that 'knowledge is constructed in a social context, and that it cannot be separated from the individual and context; it combines the knower and the known (Polanyi, 1967) and can be understood as a capacity to act in a context' (Sveiby, 2007, 1997; Paulin & Suneson, 2012). Weick (1995) argues that sensemaking is intrinsically social, and that through sensemaking people seek to affirm their identity not only by maintaining a positive self-image, but also by preserving their position within their social group. Social constructivism also entails that a group acquires a shared understanding of the world as individuals communicate ideas, and fit these ideas into their own mental model. As a result of collective sensemaking, collective knowledge is situated in a group or *community of practice* (Lave & Wenger, 1991). The mutual sensemaking can be consensual or conflictual. Conflictual knowledge can lead to tensions, possibly cognitive dissonance and political contradictions, and a group will try to minimize these tensions.

Knowledge transfer

As knowledge is constructed through interaction and dialogue among individuals (Cabrera & Cabrera, 2002), the term 'knowledge *sharing*' would seem more appropriate than 'knowledge *transfer*' (Paulin & Suneson, 2012). In our framework we nevertheless maintain Vlachos' original term 'transfer' because it expresses the direction from sender to receiver. In bilateral situations, this invites the analyst to explicitly consider the knowledge transfer in either direction. Knowledge exchange between two actors entails that they alternately play the sender and receiver role, while knowledge sharing in the sense of 'developing shared knowledge' entails that they play both roles simultaneously or, on a prolonged time scale, that the receiver after combing the sender's knowledge with experiences gained through its application, shares this new knowledge in return (Von Krogh, 2002).

Knowledge transfer is intrinsically difficult due to the constructed nature of knowledge:

- *Knowledge can be 'sticky'* (Von Hippel, 1994; Sluzanski, 2003). Being the result of a long series of mental adjustments, knowledge cannot be transferred in one single interaction moment. The sender S has to articulate and communicate the adjustment steps taken, which implies that S is aware of these steps. However, this is not the case for 'tacit' knowledge that is intuitive, largely experience based, and hence hard to define (Polanyi, 1967). S also has to find the appropriate words that are meaningful for the knowledge receiver R. This entails that S must have knowledge of the mental models of R. Then R will have to undertake its own unique adjustments to the knowledge to be able to use it the way S can use it (or to apply it in novel ways).
- *Knowledge sharing requires motivation from both parties*. Both S and R have to make the sensemaking effort. R might expect that he will perform better with the knowledge in his own social group. The knowledge might help him perform his task better and more efficiently, or create more power and social status. In case S is in the same social group as R, then S will also benefit because constructing/developing one's own identity reciprocally contributes to the construction/development of the community of practice one is involved in. S will also benefit when the cooperation between different communities of practice is stimulated. This implies that the

knowledge of S, and possibly of S's community of practice, to R is shared. Through R, the knowledge of S could also find way to R's community of practice. Knowledge sharing is thus 'the process through which one individual or group is affected by the experience of another' (Argote & Ingram, 2000).

We consider knowledge transfer to be *successful* when sensemaking occurs such that the knowledge receiver has constructed personal knowledge that is in line with the knowledge the sender intended to share. This corresponds to the second level of knowledge utilization (*cognition*) defined by Knott & Wildavsky (in Webber, 1991). The first level (*reception*) indicates that knowledge is transferred, but not necessarily digested and understood by the receiver. Cognition indicates that knowledge is successfully transferred, provided that the receiver's sensemaking is in line with the sender's intentions. As knowledge is a mental construction, this can be observed only indirectly.

Knowledge uptake

The five levels of utilization that Knott & Wildavsky (1991) identify beyond *cognition* provide a cumulative scale for what we mean by knowledge uptake. The scale is cumulative in the sense that each subsequent level builds on the previous levels:

- *reference*: the knowledge has changed the receiver's views, preferences, or understanding; this becomes visible in interaction with others via documents, e-mail, or face-to-face communication;
- *effort*: the knowledge influences the receiver's actions; the receiver can be seen to make efforts to put the knowledge into practice, or make efforts to transfer it to others;
- *adoption*: through the receiver's actions, the knowledge influences the outcomes of a decision-making process;
- *implementation*: the knowledge also influences on the way decisions are carried out;
- *impact*: this implementation of choices eventually affects outcomes of interest (Walker, 2000).

For the upper ranges of the Knott & Wildavsky scale of knowledge utilization (a*doption, implementation and impact*) to be reached in a single knowledge transfer interaction, the receiving actor must have sufficient discretionary power and resources. In a polycentric governance context, the uptake of K by R will often be limited to *effort*, i.e., R engaging as a sender in interactions with other actors. The upper ranges will then only be reached after a series of knowledge transfer interactions.

By conceptually separating the sender and receiver roles from the actors playing them, we can represent and analyse knowledge transfer processes that occur over time in a network of actors as a series of knowledge transfer interactions as depicted in Figure 2.3. In a sequence of interactions, parties can change roles: sender becomes receiver and vice versa, or receiver becomes sender in interaction with a new receiver. In such sequences or 'chains' of knowledge transfer, this chain will be as strong as its weakest link. Knowledge transfer hence is a fragile process (Von Krogh, 1998).

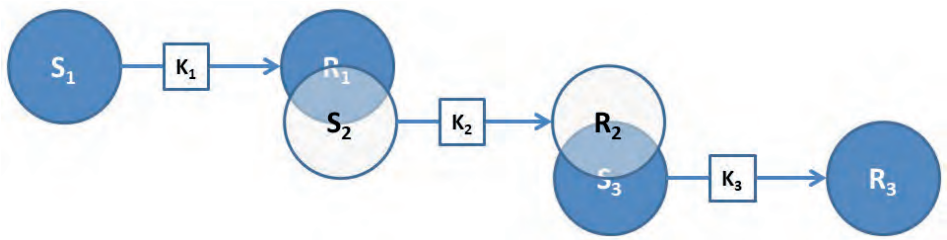


Figure 2.3: Knowledge uptake in a chain of sender-receiver interactions

Preconditions for knowledge transfer and uptake

Having clarified our concept of knowledge, and its transfer and uptake, we identify four preconditions for knowledge transfer:

P1. Relevant knowledge
Firstly, the sender should have knowledge which is (partially) new for the receiver. To reach uptake of this knowledge beyond the level of cognition, the receiver should also perceive the knowledge as relevant. Senders are likely to find it easier to transfer knowledge if they are experienced in considering a variety of perspectives (of receivers), and in framing what they know to fit such perspectives (Reagans & McEvily, 2003).

P2. Freedom to share
The freedom to share knowledge requires the absence of 'fear that the act of sharing one's own knowledge with others will lead to the loss of one's own potential or position of privilege or superiority' in organizations (Hernáez, 2011; Szulanski, 1996). Bureaucracy and formal communication, Graham & Pizzo (1996) suggest, 'inhibit spontaneity, experimentation and the freedom of expression necessary for innovative responses to environmental change' (Bennett & Gabriel, 1999). De Bruijn & Ten Heuvelhof (2002) show that the necessity of sharing knowledge is apparent: as power is polycentric, joint fact finding, and jointly seeking for opportunities is required to find consensus over knowledge and values. In contrary, scientific controversies can fuel political disputes. They provide several principles for process management, e.g. penness throughout the process ensures that all new issues and ideas can be included, as new stakeholders can shed a different light on the potential solution. Also the core values of all involved stakeholders should be protected, requiring them to share their knowledge and interests.

P3. Willingness to share
Knowledge transfer requires the willingness of a group or individual to work with others and share knowledge to their mutual benefit (Goh, 2002). Goh (2002) states that 'this implies that senders and receivers must have a natural tendency to share and collaborate with each other, [for example because] of a strong co-operative and collaborative culture'. Levin (2004) states that 'when trust exists, people are more willing to give useful knowledge (Andrews & Delahay, 2000; Penley & Hawkins, 1985; Tsai & Ghoshal, 1998; Zand, 1972)'. Willingness to share may also come from the expectation', as Jennex (2008) stated that, 'at some point in the future, the receiver will be willing to return the favour, either as knowledge shared or in some other form (Davenport & Prusak, 1998)'. In contrast, 'individuals or groups who perceive that their unique, valuable knowledge

provides them with power or status in the organization will be less likely to share that knowledge (Gupta & Govindarajan, 2000; Szulanski, 2003; Gagné, 2009)' (Schwarts, 2005).

P4. Trust of sender in receiver
Rolland & Chauvel (2000:239) state that 'trust is, after all, the single most important precondition for knowledge exchange' (Rolland & Chauvel, 2000:239). In a study by Connelly & Kelloway (2000) 'respondents noted that they would only be willing to share knowledge in contexts where they trusted the recipient of the knowledge'. Ford (2001, 2004) showed that in order for 'people to be willing to share their knowledge, they must have trust (Davenport & Prusak, 1998; Podolny & Baron, 1997; Kramer, 1999). More specifically, trust has been discussed as a prerequisite for *tacit* knowledge sharing (Roberts, 2000; Rolland & Chauvel, 2000)'. Goh (2002) states that the level of trust is a fundamental variable in cooperation between groups and individuals.

For knowledge uptake U, we identify three more preconditions:

P5. Particular knowledge need
The generic types of action that Knott & Wildavsky (1991) use to define different levels of knowledge utilization are assumed to be *intentional* actions. This entails that the receiver needs this knowledge (which may comprise *episteme, techne* as well as *phronesis*) to achieve his goals (Kruglanski & Klar, 1985). This knowledge need N may initially be latent, as the receiver may develop a 'need to know' in interaction with the sender.

P6. Fitting knowledge
The transferred knowledge K should fit the receiver's need N, at least partially. This 'fit' entails that the receiver is capable of constructing K, both mentally and socially, through sensemaking, and is motivated to do so. The receiver must therefore have adequate prior knowledge, and also (come to) believe that K will help him perform better or more efficiently, or create more power and status within his social group (Cabrera & Cabrera, 2002).

P7. Trusted knowledge
Similar to the sender, who needs to have a certain level of trust in the receiver, the receiver has to find (part of) the transferred knowledge trustworthy, or have confidence in the sender (Szulanski, *et al.*, 2004). When there is trust, people are more willing to listen to and learn from others (Carley, 1991; Levin, 1999; Mayer *et al.*, 1995; Srinivas, 2000; Levin & Cross, 2004). Szulanski *et al.* (2004) state that 'experiments in the field of communication have demonstrated that a trustworthy source could substantially affect a recipient's behaviour (Hovland *et al.*, 1949; Allen & Stiff, 1989; Perry, 1996). Likewise, theoretical and empirical studies in the field of trust show how perceptions of trustworthiness increase voluntary deference to authority in organizations (Kramer, 1999: pp. 585-586; Tyler & Degoey, 1996), and enhance institutionalization of innovations in new settings (Kostova & Roth, 2002)'.

Although they are produced by the dynamics of the larger policy context, we see these seven preconditions as *a priori* 'exogenous factors' relative to a knowledge transfer situation, in contrast to the social mechanisms that occur *during* the dynamic interaction between sender and receiver within this situation.

Need and grounds

The receiver's need N for knowledge K may stem from different grounds G. We distinguish here between substantive grounds, formal grounds, processual grounds, and strategic grounds.

A decision maker may commission a study or hire an expert on *substantive grounds*, for example, to improve the design of a dike, taking all relevant effects into account, or to better understand the risk of a technological innovation. For example, the spatial quality of a specific area is mapped, and objects are listed and documented.

Formal grounds typically follow from institutions. For example, for many dike strengthening projects an environmental impact assessment (EIA) is required by law. he intended function of the EIA is to map all possible alternatives, explore uncertainties and collect available information. It gives more insight about the system under research, it enables a sensitivity analysis of the whole or parts of the system, and the gained knowledge helps to give more insight in the uncertainties of the system and in taking 'competent' decisions. This formal ground leads to a certain need N, mainly aimed at ensuring that certain aspects (according to the rule of law) are assessed under the applicable laws and regulations. The EIA procedures then function as the formal obligation to share knowledge, or are used as a legitimization for sharing and using knowledge to safeguard the quality and thus the legitimacy of decisions. Actors have a stronger position in appeals and objections when knowledge is being produced in a transparent and legitimate way. T

By *processual grounds* we mean that the knowledge need follows from the drive to realise a jointly supported problem definition and solution, assuming that a decision process will stall without such common ground. In such contexts, a process manager may invite stakeholders to jointly develop 'negotiated knowledge' (De Bruijn & Ten Heuvelhof, 1999).

A knowledge need may also stem from *strategic grounds*. Decision makers may, for example, commission an additional study to gain support from some stakeholder group. Stakeholders may also call for additional knowledge development to defer a decision (Bressers *et al.*, 2013). These strategic grounds relate to the power dimension that we mentioned in section 2.1. Stakeholders may also use their power to manipulate knowledge so that it can justify decisions. Strategic grounds may affect the knowledge uptake.

Trust (T)

Our preconditions, in particular P4 and P7, also make trust a crucial variable in knowledge transfer and subsequent uptake. Mayer *et al.* (1995) define trust as 'the willingness of a party to be vulnerable.' Considerable evidence is available showing that mutual trust relationships lead to an increased exchange of knowledge. (Dirks & Ferrin, 2001; Mayer *et al.*, 1995). By reducing conflicts and the necessity to verify information, trust also makes knowledge transfer less expensive (Currall & Judge, 1995; Zaheer *et al.*, 1998).

Levin & Cross (2004) found that knowledge transfer is more effective when the receiver

viewed the knowledge source as being both benevolent and competent. We therefore differentiate between two types of trust T for the receiver: *benevolence-based trust* (the belief that S will not intentionally harm R when given the opportunity to do so) and *competence-based* trust (the belief that S is knowledgeable about a given subject area). Benevolence-based trust is likely to always matter. If one or more receivers believe that a sender 'may want to harm them, they will be cautious in admitting the extent of their own lack of knowledge and reluctant to learn from any transferred knowledge, regardless of its tacitness, for fear that it might be wrong or misleading' (Levin, 2004).

Explicit knowledge stands alone and can be understood apart from the competence of the source. Levin & Cross (2004) showed that 'in contrast, tacit knowledge entails insights, intuitions, and beliefs that are tightly intertwined with the experience of the sender (Bateson, 1978; Polanyi, 1966). Such knowledge is subjective and difficult to articulate (Brown & Duguid, 1991; Nonaka, 1994; Tyre & Von Hippel, 1997). As a result, acquiring tacit knowledge relies on the quality of receiver's relationship with a knowledge source (Simonin, 1999). Competence-based trust is more important for obtaining useful knowledge when that knowledge is tacit than when that knowledge is explicit'.

Trust between individuals, so called interpersonal trust (Rotter, 1967) is not required at the very beginning of the knowledge sharing process, but this trust may grow over time as a result of knowledge transfer (Kramer, 1999; Ford, 2004). Trust in the followed process may also mean that despite stakeholders have limited trust in eachother, stakeholders will share knowledge, due to this trust. Naturally, people will share more information with each other when there is more trust (Connelly & Kelloway, 2000). 'Interpersonal trust is then the focus, as individuals within the group must trust the other individuals to share their information and knowledge' (Holsapple, 2013). This links to precondition P4. Holsapple (2013) showed that 'interpersonal trust may have different bases; for instance, it could be relational trust, identification-based trust, and institution-based trust. However, if the interpersonal trust is relational trust or identification-based trust, then the group members will be more willing to share information, thus increasing the likelihood of knowledge generation (Ford, 2001; Kramer, 1999)'.

Barriers and failure mechanisms

Knowledge transfer and uptake may be blocked due to three types of barrier:

(B1) *Transmission barriers* affect the flow information between sender and receiver. This category comprises all physical barriers hampering communication (time, distance, channel noise, poor media), but also poor communication skills of S and/or R.

(B2) *Cognitive barriers* occur when R lacks prerequisite knowledge. Differences in assumptions and frames of reference of S and/or R may cause semantic distortion of messages. Based on observations in industry, Carlile (2004) categorizes these barriers along a scale of increasing novelty as syntactic barriers (lack of a common lexicon) and semantic barriers (interpretive differences in concepts).

(B3) *Psychological barriers* arise when R understands K, but experiences such inconsistency or discrepancy with his current beliefs that he is capable neither of integrating K nor of suspension of disbelief. This mechanism is known as

cognitive dissonance, meaning that K does not fit R's understanding of the real world (Festinger, 1957; Weick, 1979). Psychological barriers strongly relate to the *identity* aspect of sensemaking (Weick, 1985) when R cannot act upon K because such action is incompatible with current practices of R, or conflicts with some, both visible and invisible, core values of R or key stakeholders around R.

Even when these barriers do not arise, or can be overcome, knowledge uptake can fail through various failure mechanisms:

(F1) *Incorrect use:* knowledge K is used by R in ways for which it was not intended by S, possibly for strategic reasons of R, or because S misunderstood (the grounds for) R's knowledge need.
(F2) *Institutional restrictions*: R understands K, but is unable to absorb the knowledge, as it conflicts with core values, and way of working, thus it works prohibitive for a higher level of uptake than reference. Most organizations have an unspoken set of core values that guide both what people do and how they make sense of each other's actions. Culture is rooted in the organization's core values and assumptions, and the organizational culture is different for each organization (McDermott & O'Dell, 2001). The strength of these barriers is proportional to the inability of institutions to stretch and accommodate proposed changes (Currie & Suhomlinova, 2006; Bax *et al.*, 2009).
(F3) *Resource restrictions*: R understands K, but having no options to obtain sufficient resources, a higher level of uptake than 'reference' is prohibited.
(F4) *Dissipation*, R forgets K, and can therefore not act in the new knowledge interaction moment.
(F5) *Strategic power play*: R understands K, but acts in his own interest. R perceives K as unwelcome, thus further uptake of knowledgea is not possible.
(F6) *Diffidence*: R interacts with some other actor who by disqualifying knowledge K weakens trust T, which dissuades R from taking up K; but also the suspicion that another actor will disqualify knowledge K can dissuade R from taking up K.
(F7) *No relay*: R does take up K, and becomes the sender in an interaction with some new actor, but further uptake of knowledge fails because this new receiver is not receptive.

The conceptual framework in Figure 2.2 should allow us in a complex process as that of in the redesign of multifunctional flood defences stakeholder interactions to frame and observe in knowledge transfer interactions, and to diagnose in terms of preconditions, barriers and failure mechanisms, and think of possible interventions that may enhance the knowledge transfer and uptake. In the next chapter, we will apply the framework to a range of interaction moments to see whether we can observe the concepts it defines, and whether these helps explain why knowledge transfer and uptake processes succeed or fail. Throughout this research, we will therefore refer to this framework as FODIKI (*Framing, Observing, Diagnosing and Intervening in Knowledge Interactions).*

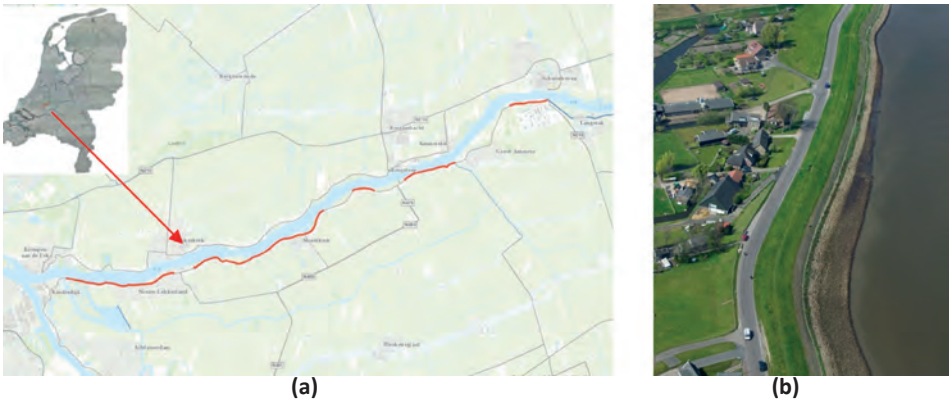
3 Proof of Concept: the historical case of Kinderdijk – Schoonhovenseveer

In the previous chapter, we presented a conceptual framework for observing knowledge transfer and uptake. This framework should help identify possible barriers and failure mechanisms that hamper these processes. We have tested the framework by applying it to parts of the dike reinforcement project between Kinderdijk and Schoonhovenseveer. This chapter begins with an introduction of this case study. We first focus on the formal approval of the project plan, which illustrates the misunderstanding aspect of the science-policy gap. We then apply our framework to two parts of the public consultation process that also have power aspects, and to the two pilot tests of innovative dike strengthening techniques, as these also add uncertainty aspects. Our findings from these five cases warrant our proposition that the framework helps identify and diagnose determinants for knowledge transfer and uptake in ex-post analysis. We will discuss the application in a 'live' case in the chapters 4 and 5.

3.1 Introduction to the case study

The second Dutch Flood Protection Programme (DFPP-2) was initiated after the second round of statutory assessments of the primary flood defences in the Netherlands, which took place between 2001 and 2006. In 88 projects, work has been carried out on 370 km of dikes, dams and dunes, and 18 locks and pumping stations.

One of these projects was the redesign of the dike between the village Kinderdijk and the ferry to Schoonhoven (KIS). KIS is part of the Lekdijk (see Figure 3.1a), a primary flood defence that directly protects the hinterland from flooding by the Lek. The initial expansion of local villages in the Middle Ages was concentrated near the dike and around the churches, resulting in ribbon development along the dike (see Figure 3.1b). The Dutch regional water authorities monitor the flood defences that fall under their jurisdiction on a regular basis, and perform periodical assessments as required by law. The Regional Water Authority Rivierenland is responsible for KIS.



(a) **(b)**

Figure 3.1: (a) Map of the location of the dike, (b) aerial viewshowing houses situated in the slope of the dike

In 2005, the KIS dike section failed to meet the safety criteria and was hence added to the Second Dutch Flood Protection Programme (DFPP-2), the immediate precursor of the MIRT programme presented in Chapter 2. The DFPP-2 programme differs from MIRT in that the financing scheme led to different project phases. Under DFPP-2, dike reinforcement is funded by central government, provided that three criteria are met: projects must be *frugal*, *robust* and *efficient* (DFPP-2, 2011). Within the scope of DFPP-2, Dutch national policy formally structures a dike reinforcement project as a stage gate process with six phases (see Figure 3.2). Each phase leads to a plan that is formally reviewed on technical, organizational, legal, and cost aspects, and requires approval by the DFPP-2 Programme Board before the project advances to the next phase.

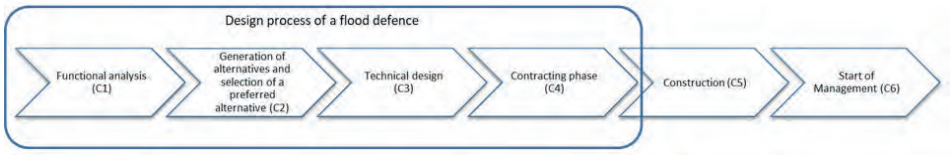


Figure 3.2: The different phases in a design process of a flood defence within DFPP-2

In phase C1, basic information is collected, and the project scope is defined. All relevant effects and aspects are identified to be used for the next phase. This functional analysis results in a Plan of Approach (PoA; in Dutch: *Startnotitie*) which is then formally reviewed by the Province. In phase C2, the project team generates and appraises alternative designs, taking into account the values identified in phase C1. Typically, a trade-off is made between the Landscape, Nature and Culture values (Walker *et al.*, 1994). At the end of this phase, the preferred alternative is formally reviewed to verify whether it meets the three criteria set by DFPP-2.

The KIS dike had to be strengthened over a stretch of approximately 12 kilometres, with houses typically located within 30m of the dike. The first KIS project manager knew how much nuisance dike strengthening projects can cause for residents, so Rivierenland considered using innovative techniques that might reduce it. Their decision-making process comprised numerous interaction moments. To establish whether the FODIKI framework affords identifying determinants for knowledge transfer and uptake, we focus on these five threads of interaction:

C1-PC The public consultation in phase C1

C1-DR The specific consultation round with directly affected residents for the pilot testing of an innovative dike strengthening technique in phase C1

C1-EC The pilot testing of the 'expanding columns' technique in phase C1

C1-MIP The pilot testing of the 'mixed-in-place' technique in phase C1

C2-TD The development of the technical design of the preferred alternative in phase C2

In our analysis of these threads, we made use of different data sources. Firstly, our personal recollection of direct observations: in phase C1, we acted as an innovation officer and consultant, ensuring that the gained insights of the pilot testing would be generically applicable in the Netherlands, while in phase C2 we acted as 'liaison officer'

between the technical manager and the external auditor. We could also use our archive of email conversations during this period, comprising over 300 pertinent messages. In addition, we used relevant policy documents, evaluation reports, ex-post interviews, and other media, as listed in Appendix A.

3.2 Interaction between policy maker and policy implementer: Formal approval of the project plan

Thread C2-TD concerns the stage gate process at the end of phase C2: obtaining formal approval from the program board of DFPP-2 of the project plan describing the preferred alternative for KIS (July 2010 - May 2012). This process was structured according to the formal framework of DFPP-2 procedural rules and criteria, but the interactions(in Figure 3.3) show that these rules left room for interpretation by the parties involved.

Actors

1. The *project team* (PT) of the RWA was responsible for the redesign of the dike. All PT members were RWA employees that had been involved in numerous dike reconstruction projects. However, KIS being one of the first projects of the RWA under the umbrella of DFPP-2, the PT had no experience with the strict DFPP-2 criteria. The expertise of the PT mainly pertained to project management; the technical design was therefore commissioned to an external engineering company.
2. The *engineering company* (EC) contracted by the PT to design the reconstruction of the dike had previously done several projects for the RWA, with an excellent track record. In the KIS project, two EC employees interacted directly with the PT: a senior consultant, who had worked intensively with some of the PT members in the past, and a junior consultant with little experience. Both consultants attended all EC-PT interaction moments. In the back office, other EC consultants were also involved in the redesign of the dike. The EC had experience with the strict procedures of the DFPP-2 in projects for other RWAs.
3. The *technical manager* of DFPP-2 (TM) was employed by the National Water Authority (*Rijkswaterstaat*) to make certain that the projects that fall under the jurisdiction of DFPP-2 comply with the formal procedures and guidelines set by DFPP-2 and central government. As an expert on DFPP-2 rules and functional requirements for dike strengthening, he was competent to assess the design on all criteria. In addition, the TM had to ensure that all DFPP-2 projects were carried out on time and within budget.
4. The *external auditor* (XA) was contracted by the TM, as required by DFPP-2 regulations, from an independent research institute in the field of water and subsoil. External auditors must strictly apply the DFPP-2 criteria to determine whether the project plan complies with national guidelines. The XA had over 20 years' experience in this field, serving as a reviewer in numerous dike strengthening projects, either on behalf of the TM, or of the RWA responsible for the project.

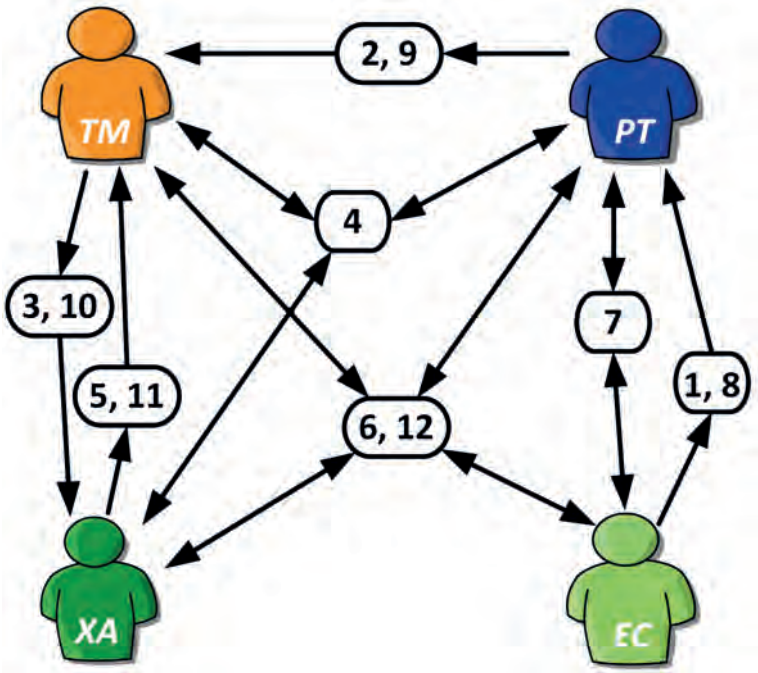


Figure 3.3: Identified interaction moments in thread C2-TD between the involved actors

In the threads, we schematically represent the interaction moments between the involved stakeholders, see for example Figure 3.3. The number of the interaction moment is mentioned in the circle. When for instance the number 7 is shown in the figure, this refers to I_7 in the text, and the numbers 1,8 in the circle refer to the interaction moments I_1 and I_8. When an arrow points to the stakeholder, he is a receiver, and when an arrow points towards the number of the interaction moment, he acts as sender of knowledge.

Interaction process

Figure 3.3 represents 12 interaction moments within thread C2-TD, starting with the engineering company (EC) submitting the dike reinforcement plan to the project team (PT) responsible for delivering this plan to the technical manager (TM) for formal approval (I_1). For want of expertise, the PT accepted the plan without critiquing it, and passed it on to the TM (I_2). The TM found the plan lacking in clarity, questioned several technical assumptions, but nevertheless proceeded with the next step in the formal approval procedure, requesting the external auditor (XA) to formally review the plan (I_3). In this interaction, the TM communicated his concerns, and asked the XA to address these in his review. In a first meeting (I_4) between PT, TM and XA the PT addressed the highlights of the plan, and answered the initial questions by the XA and TM. The XA performed the review by applying the DFPP criteria, and reported back to the TM (I_5). In his report, the XA pointed out strengths and weaknesses of the project plan, and made a range of recommendations. His most important comment was that the deviations from the guidelines were insufficiently substantiated. The TM endorsed the recommendations,

except for those which were not essential for the design but would further postpone the stage gate moments.

The TM and XA discussed the review with the PT (I_6), indicating which adjustments were essential to meet the criteria. As the PT lacked necessary technical knowledge, the EC also attended this meeting. The plan involved demolition of some fifty houses located on the slope and crest of the dike. Being obliged to financially compensate the residents, Rivierenland planned to rebuild some houses on a foundation that can be jacked up, expecting that this would facilitate future dike strengthening. The discussion between TM, XA and PT focused on the question whether rebuilding houses was appropriate for Rivierenland (being a regional water authority, not a municipality), and whether the extra costs for foundations that can be jacked up fitted the criterion that projects should be frugal.

The XA also contested the way the EC had calculated the height of the crest because the arithmetical approximation of the risk of flooding of an entire dike ring, including a robustness surcharge, differed from official guidelines. As this had led national government to withhold funding in other dike strengthening projects, the TM (and XA) could not be persuaded to use this method. The EC defended his view that on both points of critique the plan complied with the policy of Rivierenland and national guidelines, but failed to convince the TM and XA. The PT decided to revise the plan, meanwhile reconsidering the assumptions.

In the weeks that followed, the EC met a colleague, who disqualified some of the XA's arguments, and encouraged him to disregard the related recommendations. This affected the subsequent meetings between EC and PT (I_7), where the EC persisted in using a not officially approved database for determining the design water levels, even though the XA had found the EC's argumentation unclear, while the effect of choosing another database was unknown.

What then followed was a re-iteration over I_1 - I_3: the EC again submitted the revised plan to PT (I_8). The PT checked whether the agreed changes had been made, accepted the revised plan, and sent it to the TM (I_9). Although the TM still questioned some assumptions, he submitted the plan for review to the XA (I_{10}). The TM noted that the report on the geotechnical design assumptions was still in draft, and questioned whether the report was detailed enough to pass the review requirements.

When reporting back to the TM (I_{11}), the XA emphasized that some recommendations of the first review not been (properly) followed up, and elaborated the omissions in more detail. Even so, the XA found the revised plan more substantiated than the previous one, and expected that it would eventually meet the criteria. The TM then called a meeting (I_{12}) with the other three actors to share the findings of the XA. Here, demolition and rebuilding of houses was discussed, and a compromise was found that met the project constraints (time, money, stakeholder needs). The use of unofficial databases was deferred to the next project phase (C3), as the TM believed that in the next phase the PT had to collect additional information in order to better substantiate their argumentation. In subsequent interaction moments the actors expressed their confidence in the process and consecutive steps.

Analysis and interpretation

Applying our conceptual framework to this thread, we see that the *knowledge need* (N) in the interaction moments originated from a formal ground: the Dutch national policy prescribes the criteria and the formal project planning and approval procedure. The PT had to show that the design of the dike complies with the criteria, based on among others technical data, spatial quality and other state of the art knowledge. In this stage of project phase C2, all pertinent knowledge was available, but required transfer to the actors needing it. The knowledge needs were highly dependent on policy choices and formal procedures for dike strengthening projects set by DFPP-2. These procedures bind the XA to rigidly apply criteria to determine whether the project plan complies with the national guidelines. As this was the first DFPP-2 project they were doing, the project team (PT) seemed to use this stage gate in the procedure to *learn*: first to find out what was still missing in the project plan, later also to learn about the interpretation of the national guidelines. Still, they also acted as sender in this thread, as they shared knowledge about their project approach, and their interpretation of national guidelines.

Although we could test the precondition of *trust* (T) only through indirect observation, we believe that it was satisfied in different ways: knowledge sent by private parties (the EC and XA) was trusted on the basis of past performance and reputation; knowledge sent by the TM and PT was trusted on the basis of their public office, and the belief that they perform this office following rigorous procedures. The XA had met the authors of the EC reports on previous occasions, and seen some of their earlier work. From this we infer the existence of a measure of interpersonal trust and competence-based trust between the EC and XA. It is likely that this trust was increased during the face-to-face meetings (Levin & Cross, 2004). This would also explain why – despite the deficiencies in the project plan – both the XA and DFPP-2 agreed that the quality of the reports sufficed to proceed to the next phase (C3 in Figure 3.2).

The dominant *barriers* in this stage were *psychological*. Parties had divergent institutionalized approaches for the determination of the height of the crest of the dike. The EC experienced cognitive dissonance for these mathematical rules. For the two points of discussion in I_6, no shared view could be reached, as the parties had a different conviction. The parties eventually reached compromise in I_{12} by agreeing to defer both issues to the next project phase.

We also observed *transmission barriers*. In I_1-I_3, we saw that poorly written project plans lead to lack of clarity resulting in misinterpretation of messages. Differences in opinion regarding technical assumptions led to *cognitive* barriers. The lack of prerequisite knowledge of the PT was overcome thanks to the presence of the EC in the meeting with the TM (I_6). These barriers persisted because the original procedure prohibited direct contact between the XA and the PT and its subcontracted engineering company (EC) advising the PT.

To eventually reach the knowledge uptake level of adoption, two iterations were needed because *failure mechanisms* occurred. When PT plus EC misinterpreted the XA's recommendations in I_7, this *incorrect use of knowledge* (F1) meant that they had to revise and resubmit. Likewise, the diffidence (F6) of the EC after his conversation with

a colleague who contested the XA's judgement that the method used by the EC was inappropriate, led him to disregard some recommendations, resulting in a second 're-iterate' decision at the stage-gate.

Learning within the policy context

In the original DFPP-2 procedure, direct contact between the XA and PT and the subcontracted engineering company (EC) advising the PT was prohibited. The TM had to give permission to the XA to communicate with these parties. Thus, parties had no opportunity for non-verbal metacommunication (Bateson, 2000). The experience (in several dike strengthening projects) that this caused delays led DFPP-2 to revise the procedure. Our observations corroborate that involving the XA in face-to-face meetings led to better comprehension by PT and EC of the XA's critique, and resolved the XA's misunderstanding due to omissions in the project plan documents. Moreover, the face-to-face meetings helped to reach common ground (Beers *et al.*, 2006) on the interpretation of guidelines. In interviews that we conducted to evaluate DFPP-2 review processes, the TM and different external auditors and project managers were quite positive about the new review procedure, mentioning that it led to a more cooperative style of working, furthering trust among the parties involved.

3.3 Interaction between policy implementer and general public: Consultation of residents in the construction area

We will now investigate two threads of interaction between the policy implementer and the general public. Both threads were part of project phase C1 in the period 2008 - 2010. We begin with the public consultation (C1-PC), where the general public is informed about the need for the redesign of the dike. The second thread (C1-DR) focuses in more detail on a particular sub-process of the public consultation: the informal dialogue between RWA and the group of directly affected residents to obtain their consent for using an innovative technique in the vicinity of their property.

Thread C1-PC: formal consultation of the residents in the construction area

In this thread, the PT worked on the Plan of Approach (PoA) for the dike reinforcement plan in phase C1. The formal DFPP-2 procedure for this phase prescribes that the RWA should (1) define the project scope, based on several inquiries, (2) collect all stakeholder views relevant for the PoA while acquiring administrative and public support, and (3) provide specifications for the environmental impact assessment (EIA). The aim of the PT was to develop a PoA that would be 'Council of State proof', meaning that the plan would withstand any formal objection that stakeholders might lodge with the Council of State Administrative Law division. Phase C1 ended when the Province imparted its decision and specific guidelines for the EIA to the PT.

Actors

1. The *project team* (PT) is the same as in the previous thread. For this thread, we should mention that two members of the project team lived in one of the two municipalities containing the KIS project area, and hence were connected with the local community.

2. The *engineering company* (EC) is likewise identical, but here we should mention that the senior consultant also was experienced in communicating with the general public.
3. The *local residents* (LR) are residents in the area up to 150 metres behind the dike. They play a formal role in the dike strengthening procedures: the PT must solicit their substantiated views on the project plan. In addition, the residents have valuable knowledge about location-specific properties of the dike. Local residents who live on, or very close to the dike (DR) are directly affected during and after the construction period, as in some cases their homes have to be demolished, possibly to be rebuilt afterwards. For KIS, most LR and DR were already living here when the previous dike reconstruction took place in the 1980's, and still had recollections from that period.
4. The *Province of South-Holland* (P) acted as formal authority to review the PoA. The Province must put it on public display and solicit responses from the public, NGOs and other governmental bodies. These responses are then sent to the EIA committee. Based on their advice, the Province advises the RWA on what aspects they should cover in the EIA. The involved Province officials, both on executive level and administrative level, had ample experience with this formal procedure.
5. *The EIA committee* (EIAC) is an independent committee for Environmental Impact Assessment. Members are appointed by the Province depending on the characteristics of the project, to ensure sufficient expertise. The EIAC must assess the quality of the PoA, weigh and incorporate the participation responses, invite the PT to provide feedback on the substantiated views, and then advise the Province.
6. The s*ounding board group* (SBG). As explained in section 2.2, forming a sounding board group (in Dutch: *klankbordgroep*) that is to accompany a project of public interest, is a standing practice in the Netherlands. SBG members typically represent interest groups from the community: residents, businesses, agriculture, nature, tourism, cultural history, et cetera. The members act as sparring partners for the PT, and form the link with the community. A SBG also advises the executive monitoring group with respect to the dike reconstruction. For the KIS project, the SBG comprised representatives of all stakeholders along the stretch of the dike. The SBG was chaired by the context manager who was also member of the PT. Other PT members attended the SBG meetings to share and discuss information regarding the project.
7. The *executive monitoring group* (EMG). Similar to the SBG, an EMG is an informal institution to facilitate interaction. An EMG comprises representatives from all local governmental bodies: the RWA, involved municipalities, the Province, and the Dutch national water authority, and advises the project team at regular intervals.

Interaction process

Figure 3.4 shows the 21 interaction moments for thread C1-PC, starting with EC (I_1) submitting the first draft of the PoA (*Startnotitie)* for the dike reinforcement plan to the PT, responsible for the formal consultation of stakeholders in the planned construction area. The PT accepted the plan and used it as base for the resident consultation meetings. At the start of the project, the PT opted for a standard approach for stakeholder involvement, which meant that they would organize a series of public meetings, and initiate the formation of sounding board group.

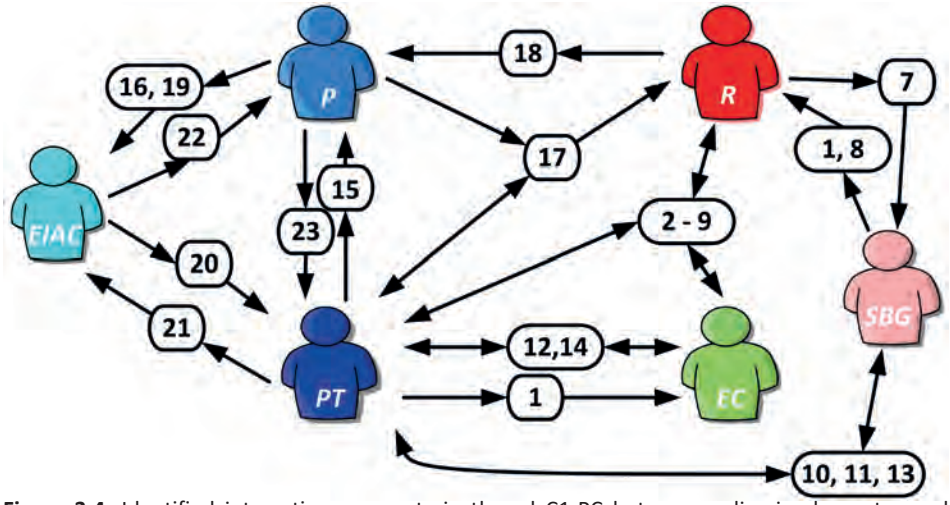


Figure 3.4: Identified interaction moments in thread C1-PC between policy implementer and general public

In the first months of 2009, the PT organized eight small-scale resident consultation meetings (I_{2-9}). The meeting objectives for Rivierenland were (1) to inform the residents on the upcoming dike strengthening project, and (2) to gain insight on the aspects that the residents find important, including local characteristics. In total, more than 500 residents attended these meetings. The EC also attended to help answer questions of the residents and to collect valuable local information, needed for the PoA. During these meetings, the PT and EC got acquainted with the local residents, and learned more about the dike and its surroundings. The PT and EC also gained information about what the residents valued, and what went wrong during the last dike reconstruction (in the 1980's). Where possible, this information was taken into account in a newer version of the PoA.

During these first resident consultation meetings, 23 residents signed up for the sounding board group. The SBG had its first meeting (I_{10}) on 18 May 2009. During this meeting, the role of the SBG, the planning for the project, and expectations throughout the process were discussed. The SBG also gained and shared information through meetings and discussions with their constituency (I_{11}) about what they found important aspects of spatial quality, what LNC elements should be conserved, and what things could be developed. By the end of 2009, The EC and PT finished the functional analysis (I_{12}) and sent a new version of the PoA to the SBG. In their meeting (I_{13}) in January 2010, the SBG generally approved of the PoA, requested more attention for (1) improving the road safety on the dike, for instance by constructing a separate bike lane; (2) improving the view on the river, and (3) protecting the wind mill area around Kinderdijk. When they also suggested using particular dike strengthening techniques, the PM explained that the suggested solutions were not technically feasible or would be very expensive, and hence would not be incorporated in the PoA. He also explained that, had these techniques been feasible, they should still not be mentioned in the PoA, being too specific for the present phase (C1), but deferred to the Technical Design phase (C3). Accepting this

explanation, the SBG limited their advice to the first three points. When publishing this advice in their newsletter, the PT did mention the suggested techniques and the reasons for not considering them in the PoA.

While iterating several times over the final draft (I_{14}), the EC and PT largely integrated the SBG advice in the PoA. The PT then submitted the PoA to the Province (I_{15}) who then, in accordance with formal regulations, sent the PoA to the independent EIA committee (I_{16}), and put it on public display for four weeks (22 March - 19 April 2010), soliciting responses (I_{17}). The PT made special efforts to stimulate stakeholders to respond in this early stage: they described the procedure in their newsletter, and informed the local residents on how they could give their substantiated view.

Residents, businesses, NGO's and other public bodies submitted their substantiated view (I_{18}) to P. In these views (Provincie Zuid-Holland, 2010), the residents mainly voiced their concern about particular elements of the PoA that could potentially damage their property. One resident also suggested using diaphragm walls instead of sheet piles. The municipalities pleaded for incorporating spatial quality, road safety and liveability aspects in addition to flood safety.

The province forwarded the collected views to the EIA committee (I_{19}), who – as prescribed by the Dutch EIA procedures – first asked the RWA for a formal response to these views (I_{20}). In their reaction (I_{21}), the PT commented on the view submitted by the two municipalities that the integral aspects were taken into account in the development of the design of the dike, with reference to an earlier report (H+N+S, 2010), while emphasizing that the municipalities could safeguard these values by taking a more active role in the regular meetings of the executive monitoring group. The EIA committee incorporated parts of the substantiated views (e.g., to consider diaphragm wall at those locations where they are considered feasible, and to consider an inner berm at the Dorpsstraat in Streefkerk) in their advice to the Province (I_{22}).

In June 2010, the Province decided on the items to be covered in the EIA, concurring fully with the EIAC advice except for the 200-year time horizon for the long-term vision for development on and along the dike, which they reduced to 100 years. This decision being imparted to the RWA ($_{I23}$), the DFPP-2 programme board made a 'go' decision for the stage-gate that marks the end of phase C1.

Analysis and interpretation

This thread shows that the *knowledge need* (N) precondition for interactions I_1, I_{12}, I_{14} (with PT as receiver) and I_{15} through I_{23} was satisfied because of formal grounds: the PT must comply with the DFPP-2 procedure for developing a PoA, the Province must ascertain that the PoA meets all the criteria set by this formal procedure, while the EIAC must comply with EIA guidelines and procedures as set out in section 2.2 of the Dutch Environmental Protection Act. For the EC in interactions I_1 through I_9 plus I_{14} (with EC as receiver) N followed from their professional interpretation of the consulting assignment contracted to them by the RWA. Likewise, for the SBG (as receiver) in I_{10}, I_{11} and I_{13}, N followed from the institutionalized tasks and responsibilities of a sounding board group.

For the local residents in I_1 through I_9 and I_{11} (as receiver), N followed from their personal interests: to minimize hindrance and impact on their property, they needed to know about the dike technology, project scope, potential risks and time frame, and also when they can bring knowledge into the process, and how they can 'play the game' in this stage of the process. In interaction I_{17}, they needed knowledge of the decision-making procedure, in particular how to submit a substantiated view to the Province.

To test the precondition of *trust* (T), we must again rely on assumptions and indirect observations. Trust among institutional actors (RWA, P, EIAC) follows from their public office and associated rigorous procedures. We also take the absence of criticism during Executive Monitoring Group meetings as a sign of trust of province and municipalities in the way the RWA conducted the PoA process. Trust between PT and EC existed because of past performance. The willingness of residents to share information and participate in the SBG, the fact that they neither questioned the necessity of dike strengthening nor rejected the initial PoA, and their constructive reflection on the PoA in their substantiated views all suggest that the residents trusted the PT. By acting as a reliable partner, communicating in a clear and concise manner on the formal procedures, the PT retained their trust. That the project manager was active in the community as a local politician may also have helped.

We observed a *cognitive barrier* (B1) during the first few resident consultation meetings ($I_{2\text{-}4}$), when the PT members experienced that they had to use a different vocabulary to connect to the world of the residents. In an ex post interview, the PM reflected that 'they were really learning while doing', striving to communicate in a clear, distinct way, while compensating for differences in prior knowledge. He also told that they purposefully asked the EC to also attend during these meetings, so that the EC would receive the residents' knowledge first-hand, avoiding cognitive barriers in PT-EC interaction.

The knowledge transferred during the SBG meeting I_{13} was taken up only partially (to the level of reference, but not beyond) due to two *failure mechanisms*: one *institutional* failure mechanism (F2) (according to the DFPP-2 procedures, the identification of alternative techniques and the choice for one technique should take place in the Technical Design phase), and one *resource-restrictions* failure mechanism (F3) (the PM's conviction that the cost of using these techniques would be excessive). We observed another institutional failure mechanism in I_{21} when the RWA did not take up (beyond reference level) the request made by the municipalities in their combined substantiated view (I_{18}) to also incorporate other aspects besides flood safety in the PoA, arguing that the municipalities should promote their interests in the appropriate policy arena.

Overall, it would seem that clear and concise communication by the PT has helped to successfully pass the stage gate of phase C1. Appropriate knowledge management smoothed the overall process. For the stage-gate decision the uptake level of *reference* sufficed. For the next thread, the uptake level of *implementation* was required, posing additional knowledge transfer challenges.

Thread C1-DR: the informal dialogue with specific residents to obtain their consent for using an innovative technique

In 2008, the regional water authority on the other side of the Lek River was strengthening the dike with existing techniques; the hinder was felt in the homes of the residents on the side of Rivierenland. The KIS project manager saw what kind of hinder dike strengthening projects could cause for the residents and thought other solutions with less hindrance should be possible. In the years before, in response to a competition set by Rijkswaterstaat, three consortia had further developed and tested three techniques that should reduce impact on nearby buildings: mixed-in-place (MIP), expanding columns (EC) and soil nailing (SN) (CUR, 2007). These techniques proved to work under certain circumstances, but the remaining uncertainties prevented the techniques to be considered as alternative for currently used techniques. The PT believed that a pilot project would resolve this and make the techniques acceptable for the KIS project as well as for upcoming dike strengthening projects. For the pilot testing, the formal procedures (including performing an EIA) were not followed, which implied that the involved property owners had to give their full consent for using the innovative technique. Aim of the PT was to obtain this consent. In this thread, we focus specifically on the knowledge sharing process between these two groups for one of the two pilot projects conducted for KIS.

Actors

- The *project team* (PT) – again identical to the previous thread – now seeks confirmation that the innovative techniques are indeed applicable and will effectively limit the hindrance for the residents during and after reconstruction.
- The *directly affected local residents* (DR) have to interact with the PT, as they play a formal role in the dike strengthening procedures. For this specific thread, DR comprised the six households whose consent was required. Most of these DR were already living on the dike when the previous dike reconstruction took place, and still had recollections from that period.
- The *expanding columns consortium* (C-EC), comprising an engineering company and a contractor, were invited by the RWA to apply the EC technique to a selected test location.
- Lacking specific expertise, the PT contracted an independent research institute in the field of water and subsoil to act as *external reviewer* (XR), meaning that they would assess technical reports delivered by the consortia, and share their expertise to help find solutions when issues would arise. The institute assigned two reviewers that had been working for over 20 years in this field, collaborating in different roles with the PT as well as with consortia members. The reviewers were intrinsically motivated to learn more about novel techniques.
- The *municipality* (M) is the competent local authority for spatial planning, and hence formal decision maker in dike reconstruction projects. Private parties, such as home owners whose house had to be demolished and now want to build near the original location, must obtain a municipal permit, as new construction must comply with spatial planning policies. During the time of the pilot testing, the municipality was in the process of merging with other municipalities.

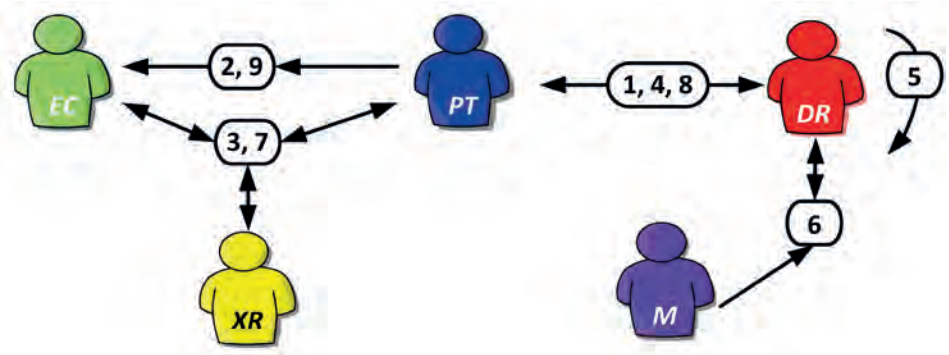


Figure 3.5: identified interaction moments in thread C1-DR

Interaction process

In this thread, we have identified 9 interaction moments between the PT, DR, C-EC, XR and M. Starting point is the series of so-called 'kitchen-table meetings' (I_1) the PT conducted with the DR to inform them about the plans for the pilot, and to collect location-specific information. During these meetings the DR expressed their concerns, asking in particular about financial compensation by the RWA if their property would be damaged during the pilot, but they also showed enthusiasm for the advantages offered by the alternative approach. With the regular procedure, residents would have to wait more than two years before they would know what the impact of the reconstruction of the dike would be. Moreover, if the pilot testing would be successful, the RWA would not have to strengthen the dike at this particular location any further, and the DR would have no more anxiety about how potential solutions might impact their living environment. During the 'kitchen-table meetings', the DR sometimes had a different concept of 'potential damages', which led to some confusion. Likewise, the PT had difficulty explaining in layman's terms why the dike had to be strengthened and which dike failure mechanisms were relevant. As both PT and DR kept on posing questions for clarification, they eventually found these meetings satisfactory.

The local information obtained from the DR dealt with historical experiences of the behaviour of the dike during high river discharges. The PT sent this information to C-EC (I_2), who was then still working on their functional analysis, and could incorporate it in their preliminary design. In several iterations involving PT and XR (I_3), the preliminary design was developed until accepted by the PT.

While C-EC continued with the next phase (developing the final design for the pilot location) the PT conducted a second series of 'kitchen-table meetings' (I_4) to discuss in more detail the development and time schedule of the pilot, and potential risks. When the DR asked about the likelihood that the pilot would fai, the PT explained to the best of their ability about the risk of failure, and possible fall-back options. The PT stressed once more that in the worst case, the final option would be to strengthen the dike section using conventional techniques. The PT also informed the DR about their decision not to carry out an Environmental Impact Assessment (EIA) for the EC pilot project, because this additional EIA would not fit in the tight time frame of the dike reconstruction set

by the DFPP-2. The PT explained that this deviation from the formal planning procedure meant that the DR would have to unanimously give their formal consent with the pilot. This prompted the DR to ask again about the financial compensation by the RWA, and by which procedure this would take place. The PT could only provide global information about procedures, but promised to come with definite information to the next meeting.

The DR talked amongst each other about what they had heard from the PT about the financial compensation procedures and the possible (dis)advantages of the pilot (I_5). They also inquired at the municipality (I_6) whether there were plans that might coincide with the time schedule of the pilot, and learned that this was not the case.

Parallel to these interactions, the C-EC further developed the design for the EC-pilot. In several iterations involving PT and XR (I_7), the final design was developed until accepted by the PT. The final design and the updated compensation procedure formed the basis for a third series of 'kitchen table meetings' (I_8). Here, the PT and DR jointly discussed the loose ends, notably the financial compensation procedure in event that the pilot would cause damages. As all of the DR consented to the pilot testing, the PT could give the C-EC green light for starting the necessary preparations for the pilot (I_9). This interaction marks the end of this thread.

Analysis and interpretation

This specific thread may well be unique, as to our knowledge (and that of the RWA) there was no precedent where residents had formal decision power in the redesign process of a flood defence. The RWA opted deliberately to involve the residents as what Arnstein (1969) calls 'co-creator', hoping that the pilot project would confirm that the EC technique was indeed applicable and effective in reducing hindrance for the residents during and after reconstruction. This would make the EC technique acceptable for the KIS project as well as for upcoming dike strengthening projects.

In this thread, the PT (as sender) tried to convince the DR (as receiver) of the benefits of the EC pilot to obtain their consent. The *knowledge need* of the DR in I_1, $I_{4\text{-}6}$ and I_8 followed from their personal interests: Having to decide whether or not to consent, they seek to reduce uncertainty (Tversky & Kahneman, 1992) and hence want to know about the dike technology, potential risks and time frame of the pilots, and also how they would be financially compensated for damages during the pilots.

Our observations suggest that the most pertinent determinants for *trust* were present, namely (1) open communication, (2) inclusion in decision making, (3) sharing critical information, and (4) sharing of feelings and perceptions (Mishra & Morrisey, 1990). The local residents believed the PT would not intentionally harm them when given the opportunity to do so (*benevolence-based trust)*. As the PT openly shared and discussed the interests at stake, communicated in a clear and consistent manner about the potential risks, and took efforts to provide additional information, trust grew during the meetings. Ultimately, T can be inferred from the unanimously consent by the residents with the pilot testing.

We observed *transmission barriers* (B1) during the 'kitchen-table meetings' (I_1 and I_4), as the PT and DR strove to understand each other by posing questions for clarification.

That the pilots induced a possible damage risk to the homes and properties might have constituted a *resource-related failure mechanism* (F3) *prohibiting uptake* (U) of the knowledge to the level of *adoption* in I_8 (consenting to the pilot), but this was avoided by the PT by providing a clear compensation procedure in case of (consequential) damages. U could therefore reach the level of *implementation* in I_9 when the RWA announced that the C-EC could proceed with the pilot.

Learning within the policy context

When we compare the two threads discussed in this section, we see several forms of social learning (Pahl- Wostl, 2002). In thread C1-PC, the PT learned how to interact with the LR in a learning-while-doing mode (Lee, 1999). In thread C1-DR, the PT and DR jointly developed their own procedural rule: if the local residents would unanimously give their consent to the pilot test, the PT would not have to develop an EIA for the pilot test. That such an agreement could be reached may be explained in terms of the streams model of policy processes proposed by Kingdon (1995): if we separate the streams of problems (the dike needed reconstruction), solutions (two innovative techniques) and power (the RWA, bound by the rules of DFPP-2), we can see the window of opportunity opening when the RWA 'empowered' the local residents by giving them the right to veto the innovative technique in return for waiving the obligation of the RWA to perform an EIA. The RWA could do this because the unprecedented situation created an 'institutional void' (Hajer, 2003) that allowed the PT and local residents to define an innovative institution.

3.4 Interaction between policy implementer and contractor: Organizational learning to mobilise creative capacity of contractors

As we mentioned earlier in Chapter 1, in the Netherlands, technical innovations for dike strengthening rarely become mainstream. Strong institutions delay the uptake of innovative techniques: Dutch regional water authorities (RWAs) normally publish their call for tenders with a detailed technical design (including estimates of required materials and construction time), projects are subject to formal review, and contractors bear all risks. Nevertheless, effort is undertaken to stimulate innovations. In 2001, the Dutch National Water Authority Rijkswaterstaat stimulated the development of innovations to improve dike stability with minimal impact on the physical environment. By means of a competition aimed at stimulating creativity of contractors, three techniques were selected for further development: soil anchoring (SA), Mixed-in-Place (MIP) and expanding columns (EC). During a six-year period, Rijkswaterstaat largely subsidized the R&D of the involved private parties. An independent committee (Expert Network Water (ENW)) advised that, after small and medium scale tests, full scale testing was required to gain experience. All three techniques were expected to become best practices after an experimental application in a full-scale test.

In 2008, severe vibrations felt during a conventional dike reconstruction project on the other side of the river Lek led RWA Rivierenland to pilot-test innovative techniques, hoping that the experience gained in these pilots would warrant full-scale application

to 10 km of dikes needing reconstruction, between Kinderdijk and Schoonhovenseveer. Rivierenland had several dike strengthening projects, where houses were located in or right behind the slope of the dike. Traditional techniques, like sheet piling, would cause hindrance during the construction and potential damages for the properties. The potential of strengthening the dike with minimal impact on the physical environment made the RWA decide to perform pilot-testing.

To highlight the relevance of the precondition of trust in situations of high uncertainty, and the effect of (lack of) trust on other preconditions, we will describe two threads, namely the development of the Expanding columns (thread C1-EC) and the development of Mixed-in-Place (thread C1-MIP). Note that the first 13 interaction moments of the threads are similar, then the two processes diverged.

Thread C1-MIP: pilot-testing with the 'Mixed-in-Place' technique

In this thread, we focus on the pilot testing with the 'Mixed-in-Place' (MIP) technique and describe the development of the design and the construction of the MIP wall are described. In suitable soils, the MIP method promises an efficient, cost-effective and environmentally friendly alternative in relation to other alternatives. Allersma & Bartsch (2003) describe MIP as 'the mixing of cement and sand with clay and peat found in-situ. This mixture forms hardened columns with improved soil properties. Vertical columns consisting of improved soil have been used for many years to stabilize dikes and embankments. What makes mixed in place innovative is the inclination of the columns. Such inclined columns are less susceptible to bending while being subjected to higher normal stresses. For this reason, stresses resulting from bending are expected to be reduced while at the same time stability is increased'.

Actors

- The project team (PT) is identical to the previous thread.
- Three *engineering consortia* (C-*x*), each comprising an engineering company and a contractor, were invited by the RWA to apply the innovative technique *x* (EC, MIP, and SN) to selected test locations in KIS. All three consortia had an excellent track record. All consortia had experience with the strict procedures of the DFPP-2 in projects for other RWAs, and some of the involved consultants had worked intensively with PT members in the past.
- The *consortium* (C-MIP) that developed the MIP technique in the past 9 years, comprised a contractor and an engineering company. The contractor has its origin in Germany, where the technique successfully was applied for other applications. The contractor was new to the Dutch dike reconstruction. The engineering company had a long history in this field and a strong record of past performance, also at this RWA. During the thread, the consortium was contracted under best-endeavours obligation.
- Lacking specific expertise, the PT contracted an independent research institute in the field of water and subsoil to act as *external reviewer* (XR), meaning that they would assess technical reports delivered by the consortia, and share their expertise to help find solutions when issues would arise. The institute assigned two reviewers who had been working for over 20 years in this field, collaborating in different roles with the PT as well as with consortia members. The reviewers were intrinsically motivated to learn more about novel techniques.

- The *technical manager* (TM) of the DFPP-2, works for the National Water Authority (*Rijkswaterstaat*) and must see to it that the projects that fall under the jurisdiction of DFPP-2 comply with the formal procedures and guidelines set by DFPP-2 and central government. In KIS, the TM also acted as the formal reviewer to financially support the pilots and also to guarantee that they will cover the risk when the pilots are unsuccessful.

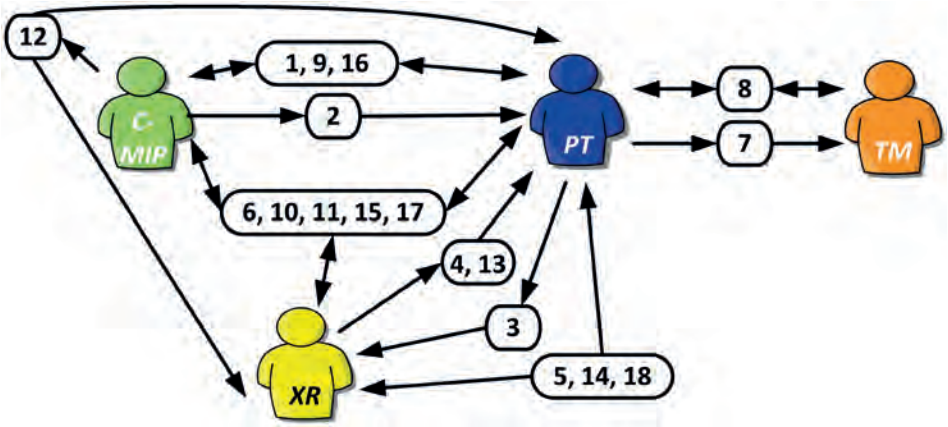


Figure 3.6: Identified interaction moments for the MIP pilot (thread C1-MIP)

Interaction process

This thread started when – to be able to decide whether or not to conduct a pilot project – the PT requested the three C-x to investigate whether their techniques could be used for strengthening specific parts of the dike (I_1). In response, the three C-*x reported the strengths and weaknesses of their technique* (I_2). The PT accepted the reports, while requesting the XR to review the plans (I_3). The XR performed the review by applying the subset of the criteria set by DFPP-2 that specifically address uncertainties around implementing innovations in practice, and reported their findings to the PT (I_4). In a subsequent meeting (I_5), PT and XR concurred that the techniques were promising, and proceeded to find suitable pilot locations.

During several meetings (I_6) the PT, XR and C-*x* further investigated which locations would be suited, based on the potential of the techniques. As the PT lacked information about the so-called 'technology readiness level' of the techniques, the XR also attended these meetings. Different perceptions on the calculation methods for the dike design and the weaknesses of the techniques led to misunderstanding between the PT-XR and the C-*x*. The PT decided to limit the number of test sites to only two locations, and invited the C-*x* to determine which techniques would be most adapted for the local conditions. As the soil nailing technique appeared to be less promising for either location, the C-SN consortium withdrew, hoping for a later opportunity to test at some other location. The PT and XR then jointly decided which location would be best suited for C-EC and C-MIP.

Parallel to this decision, the PT requested the TM, being the formal DFPP-2 reviewer, to (1) subsidize the pilots and (2) to assume the financial risk when the pilots were unsuccessful (I_7). When, after several meetings (I_8), the TM had sufficient information

about the set-up and feasibility of the pilot testing, he consented on both points. The PT then proceeded to the next step, requesting the C-MIP and C-EC consortia to make a design for their respective locations (I_9). In several iterations involving C-*x*, PT and XR (I_{10}), the relevant research questions, plan of approach, and preliminary design for technique *x* were developed. Following this plan, C-*x*, PT and XR conducted a risk assessment and identified fall-back measures for both techniques in two separate workshops (I_{11}). Both consortia sent a report on their progress and preliminary designs to the PT and the XR (I_{12}). These designs were reviewed by the XR (I_{13}) who reported to the PT.

At this point, the process for EC and MIP diverged. We will first analyse the MIP pilot, being most similar to the previous threads. When PT and XR discussed (I_{14}) the MIP technique, XR pointed out that MIP had already been applied successfully in the construction sector, and that procedures and mechanisms to ensure safety had been validated there. As basic design principles were already available, less effort would be needed to ensure that the technique could be assessed against the statutory standard. Adopting the views of the XR, the PT asked the C-MIP to further develop the design for the MIP-pilot. C-MIP then involved PT and XR in several iterations (I_{15}) until the final design is accepted by the PT. During these iterations, discussions arose about the construction method of the columns, and a more theoretical discussion about the tolerable deformation and shear stresses in the columns. The parties worked in close harmony, and shared their knowledge to improve the technique. At the end of this stage, the PT contracted C-MIP under a best-endeavours obligation (I_{16}). This type of contract was chosen because C-MIP refused a contract under performance obligation, stressing that working with innovative techniques means learning while doing. The RWA eventually accepted this argument.

During the construction phase, C-MIP worked in close concert with the PT and XR (I_{17}). They encountered several set-backs during the construction of the columns, but strove to adjust the technique to meet the requirements. During the testing at a test location, damages occurred to the neighbouring houses. Even so, the PT and XR sometimes felt that, when set-backs occurred, they had to deliver the solution. The parties brought the innovation as far as project constraints permitted. This meant that the contractor constructed the MIP columns in a different manner, adapting to what they experienced in the field. Despite caution, the pilot caused damage to the surroundings. After evaluation by the XR (I_{18}), the PT decided against using the MIP technique in the KIS project. As agreed, the DFPP-2 programme provided the funds needed by the PT to financially indemnify the DR. Building on the pilot experience, C-MIP further improved the MIP technique.

Analysis and interpretation

This thread shows that the *knowledge need* (N) precondition for interactions with PT as receiver was satisfied mainly by their desire to learn whether one or more innovative techniques could outperform conventional techniques (I_2, I_4, I_5, I_6, I_{10}, I_{11}, I_{13}, I_{14}, I_{15} and I_{17}). Moreover, the project manager had a personal driver, having first-hand experience of the hinder of the dike reconstruction on the other side of the river Lek. In the interactions between PT and TM (I_7 and I_8), the knowledge need of both parties followed from a formal ground: they had to comply with the DFPP-2 procedures for the pilot testing. The DFPP-2 procedures also bind the XR to apply criteria to determine whether the

project plan complies with the national guidelines. For the XR in interactions I_5, I_6, I_{10}, I_{12}, I_{14}, I_{15} and I_{17} the need followed from their professional interpretation of the consulting assignment contracted to them by RWA, and their personal motivation to learn about the techniques. For the C-*x* in interactions I_1, I_6, I_9, I_{10}, and I_{11} (as receiver) and for C-MIP in I_{15}, I_{16} and I_{17} N followed from their commercial interest in developing their technique into a competitive alternative.

Trust (T) among institutional actors (PT and TM) followed from their public office and associated rigorous procedures. The PT trusted XR and C-*x* on the basis of past performance and reputation. In an ex-post interview, the PM confirmed that his long working relationship with both XR had resulted in such strong interpersonal trust that he did not read reports in full detail, knowing that the XR would do this and act in the best interest of the RWA. The parties collaborated as equals to bring the innovation as far as project constraints permitted. Still, the XR and the PT sometimes felt that they had to propose all the solutions for occurred set-backs in the pilot process. In the process evaluation (Tornak, 2010), the PT stated that the contract under best-endeavours worked well for innovations, but lacked some incentives to perform 'at your best' as contractor. The team composition remained the same throughout the pilot, allowing for bonding (Szreter & Woolcock, 2004). Having directly observed most of the meetings, we also consider the absence of conflicts, the 'open' body language (Haji-Kazemi *et al.*, 2013), and the constructive behaviour of the participants as signs for mutual trust.

We observed a *cognitive* barrier (B2) in I_6 when differences in perceptions occurred on the wet and dry variant of the MIP construction method. The PT, XR and C-MIP strove to understand each other by posing questions for clarification. In order to solve the technical set-backs, the PT and XR sometimes felt that the solutions were brought by them, despite the active cooperation of the C-MIP. The interpersonal trust between the parties remained, as they openly communicated about this. In the same interaction moment (I_6), parties had divergent institutionalized approaches for designing the MIP columns. The C-MIP experienced cognitive dissonance. This *psychological barrier (B3)* was overcome after several iterations in (I_6) to reach a compromise on the appropriate approach.

In this thread, the uptake (U) reached the level of *implementation*. At first, when the contract is signed the uptake reached the level of *effort* as the knowledge of MIP technique determined the actions of the PT to proceed with the pilot testing. During the construction phase, all parties worked in close concert together, and when they encountered set-backs they developed knowledge with influenced the construction of the MIP columns and how decisions are carried out (uptake level *implementation*). Thanks to trust, they kept communicating in an open and transparent manner, with a shared goal to make the pilot into a success. As a result, no *failure mechanisms* (F) were seen in this thread.

Thread C1-EC: pilot testing with the Expanding Columns

In this thread we focus on the pilot testing with the 'expanding columns' technique (EC) and describe the development of the design and the construction of the expanding columns. Like the MIP-technique, the EC technique aims to be an efficient, cost-effective

and environmentally friendly alternative. According to Allersma & Bartsch (2003) the 'expanding columns' method 'builds on the assumption that a compaction effect of an inflating expander can improve material behaviour and thereby dike stability. Steel rods partly surrounded by geotextiles are installed in the dike. The geotextiles are inflated with bentonite suspension. Besides the compaction effect, further retaining forces are transferred into the potentially sliding soil mass'.

Actors

- The *project team* (PT) is identical to the previous two threads.
- The consortium (C-EC) developed the EC technique in the past 9 years. The contractor had a long history in dike reconstruction projects in the Netherlands. The involved engineering companies had a long record of past performance, also for this specific RWA. During this thread the consortium was contracted under performance obligation.
- The *external reviewer* (XR) is the same as in the previous two threads.
- The *technical manager* of the DFPP-2 is identical to the previous thread.

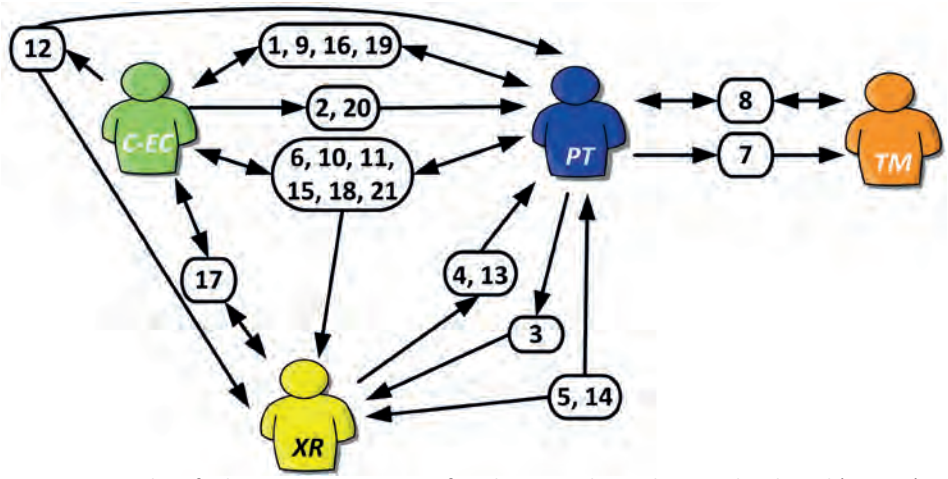


Figure 3.7: Identified interaction moments fornthe expanding columns pilot thread (C1-EC4)

Interaction process

After (I_{13}), as described in the previous thread C1-MIP, the process for EC and MIP diverged. For this reason, we start describing this thread from I_{14} on. In total, we have identified 21 interaction moments.

When PT and XR discussed (I_{14}) the EC technique, the XR pointed out that for this relatively more innovative technique no validated safety approach existed yet. Adopting the views of the XR, the PT asked the C-EC to further develop the safety approach. Elaborating this approach (I_{15}) led to an iterative knowledge development cycle in which answers induced new questions in an attempt to reduce the uncertainties of the technique. When the C-EC provided additional information and calculations, the PT and XR formulated additional questions to validate and develop the safety approach. Parallel

to this cycle, the PT contracted the C-EC under a performance obligation (I_{16}). In the light of this contract, the C-EC became very apprehensive about time and budget constraints and expected deliverables. Not knowing where and when the knowledge development process would end, they felt that RWA and the formal reviewers behaved like Eric Carle's 'very hungry caterpillar' and would be insatiable in their search for new questions and answers: answering one question led to more questions to be answered. At a certain point, the C-EC assumed that the substantive uncertainty was sufficiently reduced to start the pilot testing.

The CEO of the contractor of C-EC initiated a meeting with the manager of the XR (I_{17}). The CEO questioned the attitude and behaviour of the XR, arguing that the XR hampered the development of the innovative technique, by keeping on highlighting the remaining substantive uncertainties. The CEO claimed that as a result the PT did not proceed forward. The manager of XR highlighted that the C-EC played an important role in developing essential knowledge for the EC technique. The manager of the XR stressed that they acted upon the interests of the PT, and as such reviewed the reports of the consortium. Where possible, the reviewers also helped to find practical solutions, and therefore the manager of the XR waved the CEO's concerns away. The manager of the XR requested the contractor to discuss this also with their client, as they believed they acted on behalf of the PT, and argued that the PT also had other reasons for not starting the pilot testing yet.

In the interaction that followed (I_{18}), the C-EC took a reactive stance, which made the other parties feel that they had to do all the work. Bearing in mind Eric Carle's 'very hungry caterpillar', the C-EC was worried that all the proposed adjustments and additional knowledge questions would impede the construction of the set number of columns. As the C-EC had a performance obligation, they were obliged to construct the stated number of columns in a certain time frame and scope; otherwise they would not meet the terms of their contract. Answering a seemingly never-ending series of research questions meant that less budget was available for the construction phase. Meanwhile, the C-EC remained optimistic about the applicability of EC and the potential returns on their own investments in developing this technique. The PT still believed in the additional benefits of the EC technique. Moreover, they knew that their financial risk was covered by guarantees from DFPP-2. The XR felt at a certain point in I_{18} that the knowledge developed so far warranted the risk. As all three parties had strong incentives to carry on with the pilot, the PT accepted the final design, and agreed to move forward to the construction phase (I_{19}).

During the construction phase, the parties continued to work together. Unfortunately, the team from the C-EC was replaced in the construction phase. The new team had the task (I_{20}) to construct the number of expanding columns as stated in the contract. This hampered the learning-on-the job, as they were focussed on constructing a certain number of expancing columns. During the construction, damages to the neighbouring houses occurred. For one house, the tiles in the bathroom fell off the wall. Other properties suffered damages in the foundation. Throughout the construction phase, several interactions (I_{21}) between PT, XR and C-EC took place to deal with the set-backs that occurred on the job. During these moments the PT and XR felt that they had to come up with the solutions to deal with set-backs experienced in the construction phase, as the C-EC focussed on delivering the contracted target.

Although here, too, damage to the neighbouring houses was greater than expected, the experience gained allowed C-EC to upgrade the EC technique. Although C-EC decided not to tender for the full-scale project between Kinderdijk – Schoonhovenseveer (partially due to other reasons), they later performed a second pilot again in collaboration with the RWA, but on a different site – to test the refined EC technique. More recently, consortium C-EC successfully applied it to another dike under the RWA's jurisdiction. The EC technique is presently considered almost best practice.

Analysis and interpretation

This thread shows that the *knowledge need* (N) precondition for interactions with PT as receiver was satisfied mainly by their desire to learn whether one or more innovative techniques could outperform conventional techniques (I_2, I_4, I_5, I_6, I_{10}, I_{11}, I_{13}, I_{14}, I_{15}, I_{18} and I_{21}). Moreover, the project manager had a personal driver, having first-hand experience of the nuisance of the dike reconstruction on the other side of the river Lek. In the interactions between PT and TM (I_7 and I_8), the knowledge need of both parties followed from a formal ground: they had to comply with the DFPP-2 procedures for the pilot testing. The DFPP-2 procedures also bind the XR to apply criteria to determine whether the project plan complies with the national guidelines. For the XR in interactions I_4, I_5, I_6, I_{10}, I_{12}, I_{14}, I_{15}, I_{17}, I_{18} and I_{21} the need followed from their professional interpretation of the consulting assignment contracted to them by RWA, and their personal motivation to learn about the techniques. For the C-EC in interactions I_1, I_6, I_9, I_{10}, I_{11}, I_{15}, I_{16}, I_{17}, I_{18} and I_{21} (as receiver) N followed from their commercial interest in developing their technique into a competitive alternative. We also observed that the needs changed over time. During the pilot, more unknowns of the EC technique were discovered, leading to additional knowledge questions. This meant that along the way new needs (N) emerged. Before the PT could give the 'go' for the pilot testing, additional research was required.

Trust (T) among institutional actors (PT and TM) followed from their public office and associated rigorous procedures. Similar to thread C1-MIP, the interpersonal trust between PT and XR was high. In an ex-post interview, the PM confirmed that his long working relationship with both XR had resulted in such strong interpersonal trust that he did not read reports in full detail, knowing that the XR would do this and act in the best interest of the RWA. The PT and XR kept asking additional questions, which we earlier described as the 'very hungry caterpillar'. In a reaction, the C-EC took a reactive stance, which made the other parties (XR and PT) – feeling that they had to do all the work – lose trust in C-EC (in I_{15}, I_{18}, and I_{21}). Despite this loss of trust, all three parties had strong incentives to carry on with the pilot. The knowledge transfer and uptake continued despite thid lack of trust in the individuals, as profit was promised and foreseen. The trust in the followed process remained present. The team composition changed at the start of the construction phase, leading to a loss of tacit knowledge on the side of C-EC, and to an initial loss of trust of the PT and XR in C-EC (I_{19}), but not in the process. During the construction phase, the T of PT and XR in C-EC was reduced to a minimum level, as they felt that they had to deliver the solutions for bringing the innovation a step forward. This loss of trust was later identified in the ex-post process evaluation (Tornak, 2010). In contrast with the thread C1-MIP, having directly observed most of the meetings, we consider the presence of conflicts, the 'closed' body language, and the adverse behaviour of the participants as signs for distrust.

We observed a *cognitive barrier* (B2) in the interaction moments I_{14} and I_{17} as differences in perceptions occurred on the remaining risk of the technique: whereas the C-EC felt at a certain stage that there was sufficient information to go forward with the pilot testing, the PT and XR kept requesting new knowledge. The C-EC did not accept the sender's message to be true, thus leading to a change in the preconditions, as they were less willing to share knowledge in the subsequent interactions.

We observed a *psychological barrier* (B3) when the director of a contractor requested a meeting (I_{17}) with the management of the XR, as the director felt that the role of the external reviewer was unclear. The director of the contractor only focussed on the substantive uncertainty of the pilot that the reviewer kept on highlighting, whereas the PT of the RWA had to weigh this uncertainty with other uncertainties to proceed with the pilot. Differences in core values between the stakeholders occurred. One could also argue that *power* played a role, as the CEO of a contractor tried to disqualify the XR in the eyes of his manager, suggesting both the *strategic power play* (F5) and *diffidence* failure mechanism (F6), as the CEO of the contractor perceived the shared K of the XR as unwelcome. The XR was accused of hampering the development of EC, whereas the XR acted upon the interests of RWA. The role of 'knowledge developer' in this pilot conflicted with the 'entrepreneur' identity of the contractor, having an inherent focus on time and budget. Still perfectly acceptable for the involved engineering company, this 'knowledge developer' role was at odd with the interests and profession of the contractor.

The uptake (U) in this thread reached the level of *effort,* as the knowledge influenced the actions of the involved stakeholders in the construction phase. The changes in team composition of the C-EC prevent a higher level of uptake. In this thread, we have seen two *failure mechanisms* (F). In the aftermath, U reached the *implementation* level, as the C-EC has successfully applied the technique to another dike under RWA's jurisdiction.

Learning within policy context

We can interpret our observations on knowledge development, transfer and uptake in the two pilots in terms of *team and organisational learning. Team learning* defined by Edmondson (1999:353) is 'an ongoing process of reflection and action, characterized by asking questions, seeking feed-back, experimenting, reflecting on results, and discussing errors or unexpected outcomes of action'. *Organisational learning*, defined by Easterby-Smith & Lyles (2011) is a 'learning process within organizations that focusses on the organizational context, its patterns of participation and interaction, where learning is an ongoing activity, which cannot be controlled, only the environments, the organization can be made to facilitate organizational learning'. In the two pilots, we see quite some substantive team learning, both within and among contractor, RWA and reviewer.

In the aftermath of the pilots, Rijkswaterstaat suggested ex-post process evaluation of the pilots. As the original initiator of the techniques, they wanted to make sure that the lessons learned from these pilots were made explicit. For this reason, they initiated a technical and process evaluation. Organizational learning occurred mainly during the ex-post process evaluation of the pilots (Tornak, 2010). Besides substantive learning, organizational learning took place at Rivierenland. This occurred in several steps that we will describe below.

The differences between the two pilots made the RWA realize that the type of contract does matter when the aim is to stimulate innovation. Thus, after reviewing alternatives developed for road infrastructure, the RWA adopted as policy to tender for projects using Design-and-Construct contracts, favouring consortia that can provide the RWA and its formal reviewer detailed information on their innovations. The linked stages in D&C contracts allow contractors to develop knowledge early on, reducing the uncertainty that clashes with performance obligation. Adopting this policy meant that the RWA had to develop the competence needed to tender on the basis of functional requirements instead of technical specifications. The policy also leads the RWA to periodically consult the private sector to discuss risk allocation, and gain support for new types of procurement guidelines. When tender documents for a particular dike strengthening project comprise innovations, the RWA also installs a special committee that is to advise the RWA on whether the innovation is applicable to this project. For Kinderdijk – Schoonhovenseveer this committee reviewed several innovations.

Lacking experience in the domain of flood risk management with integrated projects, Rijkswaterstaat started an evaluation of this tender. Throughout the procurement period, substantive learning took place within Rivierenland and other involved stakeholders. The stakeholder discussed each other's perceptions on the followed process, both in interviews, and in meetings. Lessons learned were identified and reported (Deltares, 2013) which resulted that Rivierenland applied the knowledge in several integrated contracts at other dike reinforcement projects, namely both in the dike reinforcement between Hagestein and Opheusden, and in the dike reinforcement between Schoonhoven and Langerak, while freeing the creative capacity of contractors.

The project manager learned individually of the importance of contracts. Easterby-Smith & Lyles (2011) framed this as 'learners should make sense how they wish to participate in the social processes of organizing. It is not just the individuals who solely retain knowledge; rather, knowledge is distributed within and among artefacts and organizational members (Brown & Duguid, 1991; Orlikowski, 2002, 2007; Richter, 1998)'. The project manager of KIS fulfilled the role of project manager also at other projects. The dike strengthening projects are positioned in a multi-team system in Rivierenland. Here, team-based work is conducted in part 'to enable the knowledge and skills of individuals and smaller units to be leveraged across more projects in more parts of the organization (Hatch & Cunliffe, 2006; Hobday, 2000; Malone, 2004; Marks *et al.*, 2005; Scott & Davis, 2006). As teams within an organization become increasingly interconnected via shared members, organizations are more able to shift individuals fluidly and quickly from team to team to react to changing environmental conditions' (Easterby-Smith & Lyles, 2011), thus enhancing the knowledge transfer within this specific RWA..

Parallel to the redesign of the KIS dike, Rivierenland participated in several research projects to see how and where synergies between dikes and its surroundings could be possible. One of the research projects involved the development of the Climate dike at Streefkerk, part of the KIS project. This proposal eventually became part of the plan for KIS, as additional funding became possible. The project team members had learned from previous dike reinforcement projects that widening the scope of dike reconstruction projects in the early stages of a project can help discover synergies between dikes and their surroundings, and also that public participation can help improve the overall quality

of an area and provide opportunities to develop more sustainable solutions.

Rivierenland learned from other flood risk management programmes, such as Dutch Room for the River Programme (*Ruimte voor de Rivier*) as they initiated a quality team, a so-called 'dike inspiration round table', consisting of a group of experts in the fields of landscape architecture, citizen participation and urban planning. This 'dike inspiration round table' inspires and advises the project team about the approach for future dike reinforcement projects, both solicited and unsolicited. They do not only look at flood safety, but also at other functions of the dike, such as nature, recreation or living. Their aim is that dike improvement takes place in such a way that the living environment becomes more attractive and the community benefits. Besides this table, Rivierenland also initiated a management team 'linking opportunities for dike improvement and spatial quality'. This team should support project teams to increase the spatial quality, while the flood defences are being reinforced. Rivierenland sees it as a spinoff for realizing socio-economic added value in the area and a more beautiful river country.

3.5 Reflection on the proof of concept

Our aim for this chapter was to see whether the framework presented in Chapter 2 helps identify and observe relevant determinants for knowledge transfer and uptake. Having applied the framework to five different threads of interaction, we can now reflect on the usefulness of the framework for ex-post analysis.

We verified and validated our reconstruction of the KIS case with four stakeholders: two project managers, an external reviewer for the DFPP-2, and an innovation officer involved in the pilot testing of the innovative techniques and the tender procurement of KIS. Although they could not recall every detail of what happened five years earlier, they concurred with our diagnosis, and in particular the importance of the identified preconditions, barriers and failure mechanisms. Table 3.1 presents an overview of all the identified determinants. In the rest of this section, we will focus more on these aspects, paying special attention to the difficulties in how these determinants can observed and diagnosed.

Preconditions: needs, grounds and trust
A first lesson from the case study is that *needs* cannot be observed directly but may be inferred from grounds. The formal procedures within DFPP-2 (see figure 3.2) prescribe that actors must acquire knowledge: in thread C2-TD, the project team had to make a range of inquiries, e.g., with respect to soil conditions, spatial quality and cultural heritage, in order to meet the formal requirements, and in C1-PC the Province of South Holland, after putting the PoA on public display, had to actively solicit responses.

Knowledge needs also appear to follow logically from the interests of actors: in threads C1-MIP and C1-EC, we saw entrepreneurs who believed that developing innovative techniques would give their company a competitive advantage over competing contractors (commercial interest), external auditors who kept posing questions because they were intrinsically motivated to improve their expertise (professional interest) and local residents who insisted on knowing their rights and obligations because they wanted to stay in their home or rebuild their home in case of demolition, and be financially

Table 3.1: Overall overview of identified social mechanisms in the five threads

		C2-TD	C1-PC	C1-DR	C1-MIP	C1-EC
Key Knowledge		Compliance of (design) preferred alternative with (DFPP-2) criteria	- Substantiated views on PoA - Specific guide-lines for EIA	Risks and acceptable procedure	Reduce level of uncertainty of MIP to acceptable level through knowledge creation	Reduce level of uncertainty of EC to acceptable level through knowledge creation
Preconditions		Trust grew over time		Trust was high	- Lack of availability of K - N evolved over time - Mutual trust	- Lack of availability of K - Willingness to share limited - N evolved over time - T low
Barriers	Transmission	Quality of writing	Develop a joint vocabulary	Develop joint vocabulary in I_1 & I_4		Censorship of knowledge
	Cognitive	Semantic noise in I_8 and I_{12}			Differences in interpretations	
	Psychological	Cognitive dissonance	Cognitive dissonance		Cognitive dissonance (I_6)	Identity (I_{17})
Failure mechanisms	Incorrect use	Recommendation misinterpreted				
	Institutional restrictions		- Waving choice for technique to next phase (I_{13}) - RWA set request municipalities a side (I_{21})			
	Resource restrictions		Expected excessive costs of techniques (I_{13})			
	Dissipation					
	Strategic power play					CEO of contractor perceived K as unwelcome (I_{17})
	Diffidence	EC colleague contested the XA's judgement (I_7)				CEO of contractor contested the XR's judgment (I_{17})
	No relay					
Reached level of utilization		Adoption	- Effort - Reference	Implementation	Implementation	Effort

compensated for any damages. These findings imply that knowledge needs may result from drivers linked to a wide variety of factors (commercial, technological, personal, but likewise social, political, environmental, et cetera). Bearing these drivers in mind, needs can be observed as they become apparent in behaviour and utterances of actors.

The precondition *willingness to share knowledge*, or at least the lack thereof, can be observed directly. Generally, we found stakeholders both willing to share knowledge and transparent on their interests. In thread C1-EC, we observed that the contractor initially

was very cooperative, but later on took a passive stance because, as they afterwards explained (Tornak, 2010), they felt that further knowledge development became so time-consuming that it jeopardized their commercial interests. In Chapter 5, thread IX, we will see a similar pattern when local residents become less cooperative.

Trust can likewise be observed only indirectly. When stakeholders enter a situation that makes them dependent on, or otherwise vulnerable to, the actions of others without objection or defensive action, this suggests trust. Thus, when in thread C1-RCP the residents unanimously consented to do the pilot tests while knowing that the pilots might fail, and that regular dike strengthening would then be inevitable, they showed their trust in the project team. Similarly, the PT trusted that the external reviewers would act in the interest of the RWA and focus on their specific needs. The lack of taking evasive or defensive action is also an indicator for trust. Stakeholders can also express trust through their (body) language: in thread C1-MIP and C1-EC the PT expressed their trust in meetings, stating explicitly that they trusted the contractor and external reviewer in delivering the solutions for set-backs. In some meetings stakeholders complimented others, which we also saw as an indicator for trust. Body language, signals like a sympathic ear, and an open and active attitude during meetings, are indicators for mutual trust. All this requires direct observation. Finally, evaluation reports can also disclose information regarding trust. In their ex-post evaluation of the pilots, Tornak (2010) found that trust for the consortia in threads C1-EC and C1-DC were perceived as average or poor, while all our interviewees concurred that trust it is a key determinant for the success of pilot testing.

Barriers and failure mechanisms
Direct observation of *transmission* barriers and *cognitive* barriers is relatively easy. During meetings, stakeholders often ask clarifying questions when they do not understand the message, or show changes in their behaviour, e.g., defensive gestures or facial expressions. After reading a report, stakeholders can likewise ask clarifying questions, as did the XA in thread C2-TD due to the poor writing skills of the author. Although it is difficult to say whether a receiver R has understood knowledge K when R makes no reference to K, transmission and cognitive barriers can still become apparent when R takes follow-up actions that are inconsistent with K (but note that R may have strategic reasons for doing so).

Psychological barriers relate not only to the different core values of an organisation or department, but also to common routines and practices. These routines are typically situated. In thread C1-PC, the PT organised the resident consultation meetings based on their knowledge on how public participation should be organised. The set-up of these meetings differs from the set-up of a meeting between the RWA and their external reviewer: in the latter, professionals are involved with corresponding *a priori* knowledge, meaning that they have similar jargon and view of the world. Still, psychological barriers can occur between professionals when the receiver experiences cognitive dissonance and/or in case of a misfit in identity (core values). This type of barrier can also be identified when stakeholders express normative statements, as these reflect the values of the stakeholder or stakeholder's organization. Institutional values raise a potentially higher hurdle to express that one does not understand the message, as knowledge conflict with their values, which are often deeply rooted in one's current practice and

behaviour. Values are also tacit; therefore, stakeholders might unwittingly (re)act. Observing this barrier therefore requires not only training in observational techniques, but also considerable knowledge of the stakeholders' common routines and practices.

We define knowledge transfer to be successful when *cognition* occurs, which corresponds to the second level of the Knott & Wildavsky's knowledge utilization. However, knowledge uptake can still fail due to various *failure mechanisms.* We can observe failure mechanisms only in a sequence of interaction moments with stakeholders, as only then can be observed that uptake stops at a certain level. Often stakeholders make *reference* to the shared knowledge, and express concerns why they believe that this K seems invalid. Only then can the analyst positively diagnose a failure mechanism, as the receiver has shown reference and therefore uptake of the knowledge. Otherwise, the knowledge transfer was insuccessful, as one of the three barriers has occurred. We distinguished seven types of failure mechanism, but we have only seen four of them in the KIS case. In C2-TD the PT and EC misinterpreted the XA's recommendation, leading to an *incorrect use* of knowledge (F1), and the disqualification of XA's judgement of the colleague of EC led to *diffidence* (F6). In C1-PC a *resource restrictions* failure mechanism (F3) occurred, as the PM's conviction was that the cost using techniques suggested by the SBG, would be excessive. Failure mechanisms can not only be seen in subsequent meetings; the lack of higher uptake of knowledge can also be found in successive reports, where the gained knowledge is laid down.

Knowledge transfer and uptake: learning

Barriers and failure mechanisms are not static, but may be overcome. We observed that during several moments in the process the sender and receiver experienced that the knowledge transfer and uptake failed. A meta-discourse took place, where they discussed the procedures and the way they shared knowledge. During these moments, they reflected on the knowledge sharing process, leading to adaptation to new ways of sharing knowledge, that lowered or removed barriers, such that knowledge uptake regained its momentum:

- Thread C2-TD (I_6, and I_{12}) showed that the stakeholders had divergent institutionalized approaches for the determination of the crest height. The presence of the XA in the face-to-face meetings led to a better comprehension by the PT and EC of the given critique. Moreover, informed by these experiences, DFPP-2 made some modifications to the knowledge sharing process, adding the XA to the meetings in order to share the knowledge more effectively (Rijkswaterstaat, 2015).
- From the evaluation reports and direct observations, the researcher noted several meta-reflections in threads C1-EC and C1-MIP. The project manager and the external reviewer often held meetings to discuss the overall knowledge sharing process. They noted that the consortia were sometimes no longer motivated to share knowledge, and that this was hampering the process. They addressed their concerns and sought for ways to change the knowledge sharing process, such that these felt barriers and failure mechanisms disappeared. This led the external reviewer and contractor to discuss their role and interests in thread C1-EC (I_{17}). This meta-reflection furthered mutual understanding in each other's roles and (partially) restored trust in the process.

In this case study, we distinguished different S-R configurations: (1) a simple interaction between a sender and receiver, see e.g., Figure 3.6 (thread C1-MIP), (2) compound interaction moments that are chains of interaction moments between stakeholders, see e.g. Figure 3.3, and (3) a network where interaction takes place between two knowledge sharing processes. The latter is difficult to directly observe, as two parallel processes occur, where stakeholders from one chain interact with stakeholders in another chain. Figure 3.4 shows two such parallel processes: the development of a plan, and the formal EIA procedure of the PoA. Furthermore, at the end of the threads C1-MIP and C1-EC, we saw organisational learning within Rivierenland. In subsequent dike strengthening projects (Hagestein – Opheusden and Schoonhoven – Langerak) the experiences from KIS with respect to, among others, the tender procurement procedures were integrated in these projects, resulting in organisational learning.

Our experiences in this ex-post evaluation of the KIS case give us confidence that the framework is valid as analytical instrument. In the next chapter, we will address the question whether the framework can also be used as operational instrument to facilitate processes knowledge transfer and uptake in real time.

4 Framework in Action: the 'live' case of Gorinchem-Waardenburg

In chapter 3, we applied the framework post hoc to the case of Kinderdijk-Schoonhovenseveer. That gave us the benefit of hindsight. In this chapter, the dike reconstruction project between Gorinchem and Waardenburg forms the backbone for testing the framework in action. First, we introduce the case study describing the involved stakeholders, the different arenas, and the process design made by the project team for the exploratory project phase. We chose in this chapter to focus on 14 interaction-moments, in which the researcher observed and diagnosed under 'live' conditions, but did not intervene. We show that during these interaction moments diagnosis based on the framework is possible. Each moment highlights different elements of the framework. We start with a simple diagnosis, and gradually proceed to moments with a more complex diagnosis. We validated our findings afterwards with project team members. The diagnoses of the interaction moments provide handholds for possible interventions. The effectiveness of such interventions will be the focus of chapter 5.

4.1 Case study description

The Dutch RWAs monitor the flood defences that fall under their jurisdiction, and perform periodical assessments as required by law. The Dutch Flood Protection Programme (DFPP) was initiated in 2012, after the third round of statutory assessments of the primary flood defences in the Netherlands. Initially, over 700 kilometres had to be strengthened in the period between 2013 - 2027. Since 2017, new legislation came in place with stringent norms making that more than 1800 km primary flood defences had to be strengthened until 2050. The DFPP – a cooperation of the regional water authorities (RWAs) and the Ministry of Infrastructure and Water Management – has organised this massive task in more than 200 projects, ranked by flooding risk (probability times expected damages) and planned in accordance with budget constraints. Each project must not only comply with new technical design guidelines and stricter statutory standards, but also improve local sustainability and liveability (Jorissen *et al.*, 2016). The DFPP Programme board encourages RWAs to use not only new project management styles, innovative techniques, and state-of-the-art knowledge, but also participatory approaches ensuring that the public is involved, as this is in line with the new Environmental Planning Act.

Within the DFPP, three main project phases, depicted in Figure 4.1, are distinguished: exploration, plan development and construction). Each phase can be divided in several stages. In these stages different competent authorities are active: the Province acts as competent authority for the EIA in stage 3 of the exploratory phase, and the RWA acts as competent authority for the decision for the preferred alternative (final stage exploratory phase). At the end of each stage, one or more plans are developed, each plan leading to a more detailed dike design. The DFPP approach is a derivative of the MIRT-programme presented in chapter 2. The DFPP approach differs from the DFPP-2 approach (cf. chapter 3) in the risk allocation between the regional water authority and the DFPP programme: in the DFPP the risk is allocated to the RWA. The projects are subject to the DFPP subsidy requirements, meaning that a plan is formally reviewed by representatives with different backgrounds, and this team advises the DFPP Programme board.

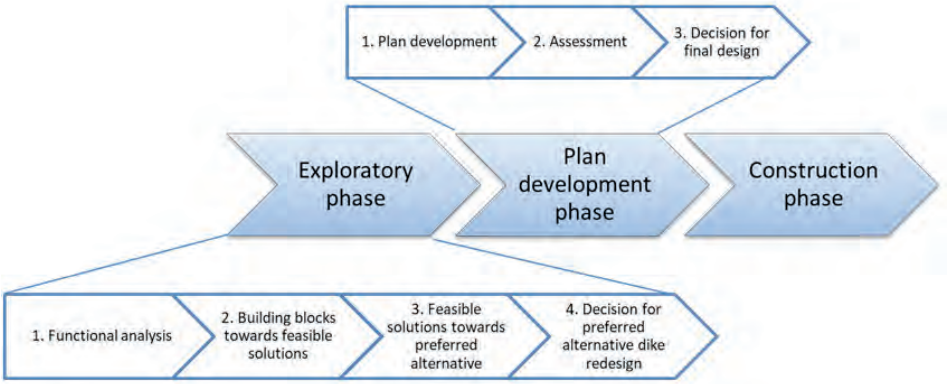


Figure 4.1 The main project phases for dike redesign projects that are part of the DFPP

Dike reinforcement project Gorinchem - Waardenburg

Our object of this study is the dike reinforcement project between the villages Gorinchem and Waardenburg (GoWa) in the Netherlands (Figure 4.2a). We focus on knowledge transfer and uptake between the actors in the exploratory phase of GoWa. The researcher investigated the four stages part of the Exploratory phase (DFPP, 2017a), taking an action research approach (as explained in chapter 1) in the period between December 2015 - December 2018. In that period, the GoWa project team (PT) worked on the functional analysis and the building blocks towards feasible solutions, handing over the project to the Graaf Reinald Alliance, which delivered the preferred alternative successfully, moving the project forward to the plan development phase.

GoWa is part of the Waaldijk, a primary flood defence that directly protects the hinterland against flooding by the Rhine. The local villages expanded around the churches and along the dike, resulting in ribbon development (Figure 4.1b). The RWA *Rivierenland* is responsible for GoWa.

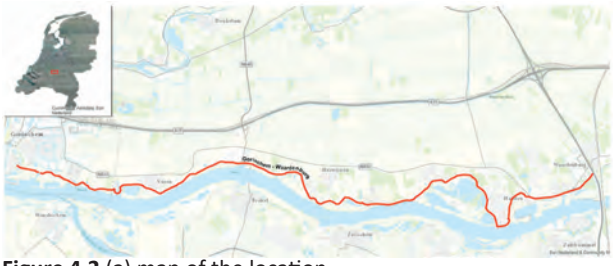


Figure 4.2 (a) map of the location (b) featuring houses, situated in the slope of the dike

In 2011, the GoWa dike section failed to meet the safety criteria over a length of 14 km and was added to the DFPP as one of the most urgent projects. In 2014, the PT started with the exploratory phase, and soon found that, by the new safety standards, the project scope had to be expanded to the full extent of the dike (23 km). Where the RWA typically used to inform the public once the first designs of a dike where made (Van Buuren & Edelenbos, 2008), they now decided – partially due to the upcoming

Environmental Planning Act, because the desire of the board of directors wanted to stimulate community engagement – that they should engage relevant stakeholders in an earlier and still more open project phase, see Figure 4.3.

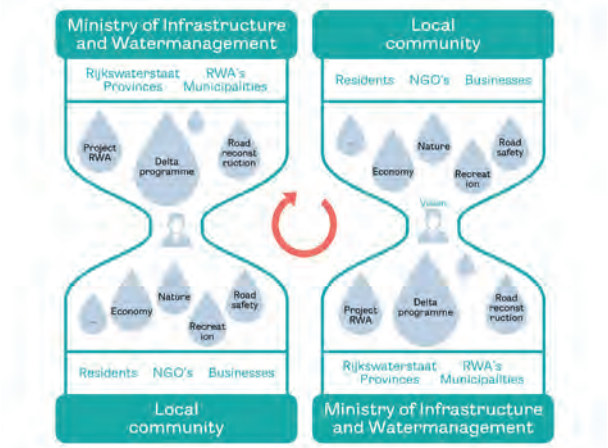


Figure 4.3 Change from reactive cooperation towards co-creation (Tromp *et al.*, 2018)

Besides community engagement, the RWA also aimed for collaborative contracting. Based on an internal study, the RWA knew that inadequate exchange and poor quality of data and communication, and insufficient attention for the construction phase during the design process tend to lead to higher failure costs in the transition between the exploratory phase towards the plan development phase (WSRL, 2018). Therefore, they opted to go forward with alliance contracting. This is still uncommon in flood risk management in the Netherlands, as only one other project has this type of contracting: the reconstruction of the Markermeerdijken, where they chose for this type of contracting due to the planning constraints. The RWA *Rivierenland* chose for alliance contracting to realise a smoother succession of the project stages, to meet the ambitious planning. The RWA also hoped to benefit from sharing knowledge between the RWA and contractors, via a 'Best for Project' approach. The alliance at GoWa worked as an *incentive-based relationship* (WSRL, 2018) in which the parties agree to work together as one integrated team. The base principles of the characteristics of the GoWA alliance project were: (1) a culture of cooperative decision-making, (2) risk sharing, (3) no blame and no dispute, and (4) financial transparency. The tender procurement period ran between September 2016 and July 2017. Three consortia participated in this tender, where the Waalensemble came out as the winner. Members of the Waalensemble and Rivierenland started in the Graaf Reinald Alliance as project partners as of July 2017.

Involved stakeholders

The redesign process of the dike involves a variety of actors and coordination mechanisms. The project team must interact with three municipalities (Gorinchem, Lingewaal and Neerijnen), two provinces (Gelderland and South-Holland), and Rijkswaterstaat,

many different interest groups, and – last but no least – the legal team within the RWA *Rivierenland*. We will briefly introduce each stakeholder. We typically distinguish between two levels: the executive level officials (*bestuurders*) who have been elected to their office, and the administrative level officials (*ambtenaren*) who are staff employees.

- The *regional water authority Rivierenland* (RWA) is responsible for the dike, and hence monitors all flood defences that fall under its jurisdiction, and performs periodical assessments as required by law. If necessary, Rivierenland will strengthen the dikes. Within DFPP, they also pay 10% of the project budget; the other 90% comes from a fund to which all RWAs and the central government contribute. A member of the dike board (*heemraad*) is the executive portfolio manager on an executive level for the dike strengthening projects. Together with the other dike board members and dike reeve he ratifies the project plan when all prescribed formal procedures with the community and other governments have been completed.
- *The Programme team Rivierenland* is responsible, at the administrative level, for all dike strengthening projects within Rivierenland. Their aim is to run the projects as smoothly as possible, and to inform the executives in a standardized, formal manner. They strive to share knowledge between projects to prevent reinventing the wheel over and over again. Until the beginning of 2018, two members had a longstanding track record, dating back to experiences in the eighties. They also had an interest in the substantive decisions that project teams must make. They both retired early 2018, after which some changes were made to the Programme team. The new Programme team gave additional responsibility to the dike strengthening project teams within Rivierenland.
- *The GoWa project team (PT)* of the RWA is responsible for the redesign of the dike. This team consists of a project manager, two context managers, a contract manager, a technical manager and a project control manager. All members work for the RWA, except for one freelance context manager and the freelance technical manager, who both have worked in this field for many decades. The project manager and technical manager each have a track record in dike reconstruction projects. As GoWa was one of the first projects of the RWA under the umbrella of DFPP, the PT had no experience with the DFPP standards and criteria. After the start of the alliance, some PT members became became part of the alliance, while others started working on other RWA projects.
- The *Waalensemble* is the consortium who won the tender for the dike reconstruction between Gorinchem and Waardenburg. It comprises three Dutch contractors (Heijmans, GMB and De Vries & Van de Wiel) and the engineering company Royal HaskoningDHV as consultants. Since early July 2017, the consortium works with colleagues from the RWA to jointly deliver the reconstruction of the dike between Gorinchem and Waardenburg. All project partners have an outstanding track record in Dutch Flood Risk Management.
- The *Graaf Reinald alliance* (GRA), comprises of RWA Rivierenland as 'legal entity' and the Waalensemble. It is responsible that the dike is strengthened according to the given constraints from Rivierenland, specified in the alliance contract. The project partners contribute different disciplinary knowledge and skills. On an individual level, some already have a long history in the field of dike reconstruction, and more specifically with Rivierenland. In the tender procurement, the compatibility of involved professionals and the collaboration with the RWA were important

considerations. If necessary, colleagues with other backgrounds from both the RWA and the Waalensemble are working in the project, to deliver the ultimate desired scheme.

Other governmental organizations

- *Rijkswaterstaat (RWS)* is responsible for the design, construction, management, maintenance and operation of the Dutch national road network, the waterway network, and water systems. The waterways must always be passable and safe, and journey times by water must be reliable. They are also responsible for the construction and improvement of existing waterways, harbours and moorings. Rijkswaterstaat regulates the river discharge and maximum water level, which means that dike reconstruction should in principle not expand into the floodplains. If such expansion is inevitable, the RWA must ensure that the increase of maximum water level is compensated by modifications of the floodplains.
  The RWS director responsible for GoWa has a seat in the Executive Monitoring Group (EMG). He had worked for many years in maintaining the main infrastructure facilities. He was succeeded in April 2018, when he left for the House of Representatives of the Netherlands. Rijkswaterstaat has a delegate in the Administrative Monitoring Group (AMG) who has worked along similar projects, and acted as a liaison with other parts of his organization.
- The three *municipalities Gorinchem, Lingewaal* and *Neerijnen* have autonomy to decide on a wide range of issues, such as building community buildings, creating cycle paths and building houses. Municipalities also have to implement a wide variety of national laws, ranging from the Environmental Management Act to the Social Support Act. For the dike strengthening projects the municipality grants the necessary permits and amends the zoning plan. City council members of all three municipalities have a seat in the EMG, and the responsible officers are active in the AMG.
  - *Gorinchem* aspires to having the '*Nieuwe Hollandse Waterlinie*' become part of UNESCO World Heritage. This 19th century military defence line marked the administrative and economic heart of the Netherlands – Fort Holland. It was designed to keep out invaders by the controlled flooding of a chain of inundation fields to a depth of up to a metre.
  - *Lingewaal* was merged with the municipalities Neerijnen and Geldermalsen into one municipality from 1st of January 2019. The focus of Lingewaal is to enhance nature and recreation after this dike reconstruction. For some flood plains, the municipality has ideas to increase the liveability; this also includes reinvestigating the feasibility on the long term for local businesses. The alderman has been long active in the municipality. The involved administrators have a long history in the community and are, among others, active in nature, recreation and road safety.
  - *Neerijnen* has two dike strengthening projects in their area, which puts a lot of strain on the the involved professionals. The alderman has a long track record in executive jobs for the RWA and municipalities. The responsible adminstrator changed three times, and in combination with the planned merger, the municipality has difficulties to dedicate sufficient time to both projects. Colleagues from Lingewaal often help out, and act on behalf of both

municipalities. The residents appear to be dissatisfied with the way in which the municipality listens to their wishes and acts, which will influence their behaviour and emotions.

- The two provinces *Gelderland* and *South-Holland* develop regional policies and draw up regional plans, setting out the zoning guidelines for the location and expansion of residential, industrial and commercial areas within cities, towns and villages. Provinces are responsible for spatial planning and preserving a healthy environment with clean air, water and soil by regulating emissions from road transport, industry and other sources. The Provinces play a formal role in reviewing the project plan in the project phases.
  - *Gelderland:* The Provincial executive is involved since 2012 in other dike reconstruction projects in this role. From the start, two provincial administrators are involved. The elder administrator shared his knowledge with the other administrator , via a master-apprentice relation. After the retirement of the elder, the former apprentice acted as liaison for the project.
  - *South-Holland* has delegated their role on the executive level to Gelderland, as only 3,5 km of the 23 km lies in the Province of South-Holland. On the administrative level, it does take part in the GoWa project, and the administrator delegate has an outstanding track record in projects in different dike strengthening programmes.
- The *Dutch Flood Protection Programme* (DFPP) administers some 200 dike strengthening projects, ranked by flooding risk and planned in accordance with budget constraints. They review the documents throughout the different project phases, such that the GoWa plan complies with the set criteria. The executive took an active role in highlighting the role of DFPP and the constraints, whereas the administrator took a passive role in the AMG, being a so-called agenda member, which means that he did not attend every AMG meeting, but only occasionally, which depended on the draft agenda. Both on the administrative and the executive level, the DFPP was active until July 2018.
- The *Cultural Heritage Agency* (CHA) is the executive service that implements national policy on archaeology, monuments, historical landscape and movable heritage. The varied work of the Agency includes generating and disseminating knowledge, implementing policy and legislation, administering subsidies, and providing practical advice. In the GoWa project, the *Hollandse Waterlinie* runs to become UNESCO World Heritage. On an administrative level, the CHA provided advice how the project team integrated the current heritage in the dike redesign.

<u>Residents and voluntary associations active in the Sounding board group.</u>

- The *local residents* have to interact with the PT, as they play a formal role in the dike strengthening procedures. They can give substantiated views on the project plan. In addition, the residents have valuable knowledge about the specific circumstances of the dike. The residents who live in the vicinity of the dike are affected during and after the construction period. In some cases, homes have to be demolished, and sometimes they can rebuild. Most residents were already living there when the previous dike reconstruction took place, and still have positive as well as negative recollections from that period. Residents of Herwijnen, Dalem, Tuil and Waardenburg are represented in the sounding board group by a community

member. Since April 2018, a representative of the village Haaften is also part of this meeting. These residents represent the local communities, but do not have a 'formal' voluntary association. These representatives have a positive reputation in their own community and are trusted based on their performance.

- The *Dorpsbelangen Hellouw* is a voluntary association with the aim to serve the interests of the residents of Hellouw. In the past years they have been politically active to persuade the province and municipality to construct a roundabout on the provincial road to increase the road safety for the local residents. The president of the association is also active in the public participation process of GoWa, to act on behalf of all interests. The president has a professional career at a municipality.
- The working group '*Vesting Gorinchem*' is a voluntary association aiming to increase attention and appreciation for the Gorinchem fortifications, and to profile Gorinchem more as a fortified city. The two involved volunteers see opportunities to further highlight the fortification of Gorinchem and to re-create elements of the fortification, such as the shot fields.
- The *Nature and bird watch Alblasserwaard* is a voluntary association with over 800 members. The members make inventories and count the variety of birds in the polder Alblasserwaard.
- The *foundation for the preservation of the water level gauge house (Peilschaalhuisje)* in Herwijnen. This *peilschaalhuisje* was built in 1874 and is currently a national monument. Their aim is to preserve this building for future generations.
- The *working group White stork station Herwijnen* is a voluntary organization that aims to boost the population of white storks in the Netherlands. Around Herwijnen 18 white stork couples nest. The working group aims is to create an additional nesting area for the white storks.
- The *Sounding board group Gorinchem-Oost* is an initiative of the residents. The sounding board group gives the municipality of Gorinchem solicited and unsolicited advice on a range of topics. Their aim is to actively represent the interests of the neighbourhood. The involved residents are the so-called 'eyes and ears' of this community. They are 'agenda member' of the GoWa sounding board group.
- The *AWN afd. Lek- en Merwestreek* is a local working group, part of the Archaeological Working Community Netherlands (AWN). The AWN is the largest association of amateur archaeologists in the Netherlands (three thousand members), divided into 24 sections. The Lek- en Merwestreek working group (with approximately 100 members) covers the area of the Alblasserwaard-Vijfheerenlanden and the Eiland van Dordrecht. The aims of the association are: (1) discovering and preserving unknown archaeological sites; (2) increasing the knowledge and skills among its members, and (3) contributing to raising awareness among a larger audience.
- The *Vuren Actief* is a voluntary association, that organizes activities for the residents of the village Vuren, and also develop citizens' initiatives on topics that are perceived important for the local residents. In the past 10 years, they proposed ideas to create better social cohesion in the village, including plans for a health centre in combination with child day care and apartments. They also have several ideas for improving the liveability of the dike stretch in Vuren. Their representative in the GoWa sounding board group has been involved for many years in flood risk management measures along the river Waal.

Involved action arenas

In the GoWa project, knowledge is shared in a variety of action arenas. We distinguish between three different types of arena: formal institutional, community engagement, and substantive.

Formal institutional action arenas

The formal role of these arenas is explained in paragraph 2.2. Here, we list their characteristics specific to GoWa.

1. The *Sounding board group (SBG)* is led by an independent president, who also participates as an advisor in the executive monitoring group.
2. The *Administrative monitoring group (AMG)* is currently led by the overall DFPP project manager of Rivierenland. Members of the project team attend AMG meetings to share and discuss information.
3. The *Executive monitoring group (EMG)* is led by the responsible board member of Rivierenland. The chairman of the SBG attends the EMG meetings to share the opinion of the SBG. The context manager of the project writes the minutes of these meetings.

The SBG, AMG and EMG meetings always take place in this order. The project team or other members of these meetings share knowledge in and between these meetings.

Community engagement action arenas

The project team initiated an intensive community engagement approach with residents, and shared knowledge about the dike redesign process in two forms of interaction, that were completely new for Rivierenland.

4. Five **'***Ensemble' working groups (Ensemble)*, consisting of approximately one hundred enthusiastic and cooperative community members that have some sort of connection with the dike. In these working groups, they developed ideas and vision on their living environment in relation to the dike reconstruction.
5. The leaders of the five ensembles held separate meetings – so-called *Ensemble leaders (ELs)* meetings with each other and the two context managers of the project, in order to share their progress and to ensure that the ensembles presented their vision in a similar manner. In these meetings the PT shared additional information about the project progress, as well as whether ideas of the ensembles are being brought further with support of (other) local governments and NGO's. During the project, the ELs meetings became institutionalized meetings that were always held before the SBG meeting.

Substantive action arenas

In these arenas, the focus lies on team members sharing, developing, and co-constructing substantive knowledge to bring the project forward.

6. *Project team meetings*: Before the alliance started, the PT worked on the functional analysis to define the scope of the project. The PT conducted several inventories to better decide what the scope is, based on new legislation. Each project team member worked together with other RWA colleagues. During the project team meetings, they shared information on progress and actions, and discussed the required subsequent steps in the process. The project manager was the chairman of this meeting.
7. *Graaf Reinald Alliance team meetings:* GRA has the responsibility to design and construct the dike according to the current legislation within a certain time frame. Members from Rivierenland and private parties work in close concertation together to deliver this task. Half of the personnel came from the RWA, and the other half from the private parties, thus ensuring that sufficient expertise was available. The GRA organised themselves in teams: context management, design and engineering. The team leaders organised meetings to share and discuss knowledge between teams. The context managers often operated between the teams, as they required the information while talking to regional partners and residents. The GRA was led by the alliance manager and three other team leaders. Executives of the involved partners took a seat in the GRA Programme Board.

Knowledge transfer and uptake in the exploratory phase: process design

The RWA executives considered public participation important and had embraced the credo 'the dike is for all of us', but did not give further explanation what that meant. Therefore, the project team had been looking for ways to shape public participation, and instead of seeing the dike as an isolated line element, they wanted to consider the dike in its surroundings. Already in the early stages of the project, the PT opted for a strong community engagement. The PT distinguished two tracks; (1) the *design* track, where the professionals developed the dike design according to the 'standard' DFPP/ MIRT phases, and (2) the *participation* track, where the residents developed their vision on the dike, and engaged as community. The PT crafted a process from 2014 onward that would allow them to collect views from the public. As the RWA was in the middle of a tender, the residents had approximately one year to develop their visions. The PT used the 'local train and high-speed train' as metaphor to explain the process to the residents. They saw the development of a vision as the local train, as residents had to collect knowledge and develop a vision together, which takes time, just as it takes time for a local train to reach full speed. The PT foresaw that they should share information with the residents to enable them to talk with the designers of the dike reinforcement project. At the same time, the PT was working on (a) completing the scope and safety analysis of the GoWa project, and (b) forming an alliance with market parties by means of a tendering procedure. The RWA opted for alliance contracting to realise a smoother succession of the project stages, and to meet the ambitious planning. The PT expected that as soon as the alliance started, the experts would speed up the development of a preferred alternative, in order to make up for lost time. The PT saw this as the high-speed line, that would stop at certain moments at so-called train stations to collect and share knowledge. Before the start of the alliance, the PT visualized that information could be shared between the local train and the high-speed train at various pre-arranged moments – train stations – to ensure that the ideas from the local community were sufficiently integrated. We will briefly describe the design and participation track, where we distinguish between before and after the start of the alliance, see figure 4.4.

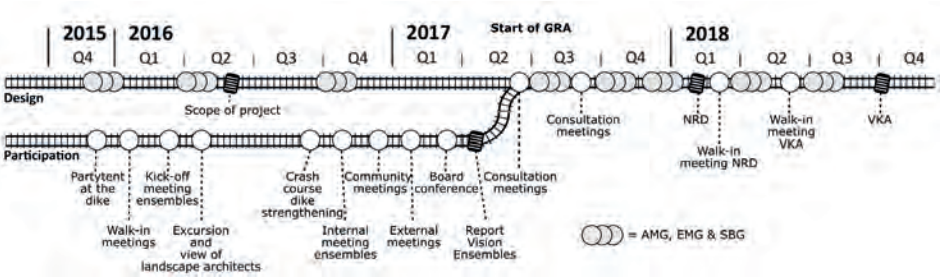


Figure 4.4 Overview of the process design with the design and participation track (adapted from Graaf Reinald Alliance, 2018b) The train stations are among others the consultation meetings.

Process design before the start of the alliance.

Participation track

In 2014, the PT held regular resident information meetings aiming to inform the public on the upcoming dike reconstruction project. In an attempt to combine the local ideas and initiatives with the dike design, the context manager designed a process to ensure that when the design track was on full speed, these ideas could be incorporated. After the walk-in meetings early 2016, the context manager asked for support from the sounding board group for this more intensive public participation approach. The members of the sounding board group were enthusiastic and wanted to be ambassadors. In May 2016, the PT held the kick-off meeting ensembles. At first, the PT divided the 23 km dike into four areas, as from the RWA's analysis of the current spatial quality (Waterschap Rivierenland, 2015), they draw the conclusion that there were four specific locations on which stakeholders had strong opinions. The PT organised the participants in four so-called 'ensembles' focusing on these locations. During the kick-off meeting, the PT gave a plenary presentation on the mission and general way of working for each ensemble, emphasising that the PT would facilitate the ensembles as much as possible, but not participate in their meetings except on request. The residents introduced themselves within their ensembles, shared their first ideas for the vision, and elected an ensemble leader. The PT was receptive to the needs of the ensembles. After the kick-off meeting ensembles, the residents requested to add a fifth specific location as they believed there were valid reasons for highlighting the area between Tuil and Waardenburg. This resulted in the formation of a fifth ensemble.

In the weeks that followed, ensembles requested additional information, in particular on dike strengthening techniques, how dike reconstruction takes place in practice, and to how incorporate spatial quality in the dike design. In response, the PT joined some ensemble meetings to answer questions on technical aspects of dike strengthening, organised an excursion to a different dike reinforcement location, and invited two landscape architects to present how flood defences elsewhere had been integrated in their surroundings. Noting that the five ensembles posed similar questions, the PT organised a tailor-made 'crash course' for residents on how to strengthen a dike, and prepared a handout explaining alternative techniques.

The five ensembles were Linielandschap, Vuren, Herwijnen, Crobse Waard-Haaften, and Tuil-Waardenburg. Each ensemble would organise themselves differently:

- *Linielandschap*: The members of this ensemble did not know each other well, as most communication took place via the email (e-community). The EL was a trusted person amongst neighbours, acted as spokesperson, and having a busy calendar, this e-community worked for him.
- *Vuren*: At first this ensemble comprised three active elders, who already worked together for creating more room for the river (Rijkswaterstaat, 2019). Later on, they found support from younger people. They informally shared knowledge in a two-way direction with their community. The first EL was highly visible in, and also trusted by, the community. His successor gradually gained more respect.
- *Herwijnen:* Some members of this ensemble already knew each other from the White Stork station. They jointly decided to split the ensemble with subleaders to focus on four geographical areas. They worked in a very structured manner with agenda and minutes. The EL was highly motivated and had organised the ensemble efficiently.
- *Crobse Waard – Haaften*: This ensemble was less cohesive, with more frustration and anxiety whether their ideas would be realised, partially due to a history with the municipality. Here, there is explicitly tension between personal and collective interests. On several occasions, ensemble members had a high-flown quarrel about the scope of RWA's question, and conflicting ideas/interests. The first EL became ill and had to resign. The second EL strove to ensure that all the ideas could be taken on board. He was also looking for a way in which he could guide the internal process. Another member from the ensemble is currently helping him to involve the community.
- *Tuil – Waardenburg*: This ensemble was a small group, sharing homemade apple pie at every meeting. To inform the others, the EL provided written feedback from all other meetings he attended. The EL was trusted by the direct neighbours. He was focussed on the Natura 2000 areas, and wanted to ensure that all the ideas of the ensemble would be considered.

During the first steps of the stakeholder engagement process, the ensembles did not share their ideas with the PT or with other stakeholders (e.g., EMG and RWA). On several occasions, some executives asked about the plans and ideas of the residents, partly in the context of expectation management – as not all ideas fitted the local policy. In response, the PT mapped out a follow-up process in which the stakeholders would be involved, and hired two landscape architects to map and visualize the vision of the ensembles.

Once all five ensembles had elaborated their vision, the PT organized a plenary internal ensemble meeting to share the results, since the ensembles had worked independently, and not seen each other's output. The maps developed with the architects formed the central starting point of their presentations. The ensembles imparted their vision in different ways, ranging from a full-fledged presentation to merely projecting the map and highlighting some elements of the vision. Afterwards, the ensembles incorporated some ideas of other ensembles into their own vision. In their next meeting, the ELs and the PT jointly derived common themes, such as road safety, flood safety measures, recreation and nature, resulting in a shared vision and a common slogan for all ensembles. As the vision included several ideas that implied other governmental organizations, the PT suggested presenting the ensembles' visions to these partners, at administrative level as

well as executive level. The residents asked the PT to organise community meetings first, so that the ensembles could gain support for their vision from their own community. The PT obliged, and gave a presentation of the necessity of dike reconstruction during these meetings.

The updated vision for each ensemble was then presented to administrators. The PT aligned the ensemble presentations so that they would be more coherent, and one EL presented the shared vision and common slogan of all five ensembles. Several ideas were apparently received as good opportunities for synergy, as the administrators referred to this meeting to show that their policy ideas were coherent with the ensembles' vision. On the other hand, some private parties were shocked by the ensembles' suggestion to relocate their businesses, and became wary and sceptical of the approach.

In the same period, the PT and members of the ensembles presented their work to the councils of the involved municipalities, as these councils have the formal power to grant permits and make amendments to the zoning plan. In the following EL meeting, the vision of the five ensembles was summarised in 25 ideas that would be presented to municipal and regional executives, asking them to support bringing the ideas further, and to assess their feasibility. Reflection on the previous meetings prompted the PT to propose making short videos to tell the story of the resident's ideas. The ELs were pleased with this intervention, as they were apprehensive to present their ideas to an audience of executives. When planning the meeting, some executives appeared to misunderstand the purpose of the meeting, believing that 'giving support' implied commitment to additional funding. Eventually, all 25 ideas gained support from at least two regional authorities.

The 25 supported ideas were laid down in a so-called 'initial product', which formed an input for the continuation of the exploration phase when the alliance would start with designing in iterative steps the preferred alternative (see Figure 4.4, *Report Vision Ensembles*). Just before the summer 2017, the PT organised a social event to look back at a year's hard work, place the ensemble leaders in the spotlight, and highlight a new start for the project, as the Graaf Reinald Alliance would start during the summer break.

Design track

In the period between 2014 and July 2017, the engineers of Rivierenland re-defined the scope of the project. At first, only 14 kilometres of the dike did not meet the statutory requirements. After analysing the consequences of the new safety standards, they found that the project scope had to be expanded to the full extent of the dike (23 km). Additional soil research was needed to perform the necessary analyses. Around the summer of 2016, the board of Rivierenland made the formal decision on the project scope.

The tender procurement period ran from early 2016 till eventually July 2017. Early 2017, there was a small hick-up, as some procedures had to be redone to reduce the likelihood of the tender being declared invalid because of a procedural error. The PT was busy drawing up all the necessary tender documents to inform the potential consortia of the project scope, risk management and financial and legal incentives, as well as the community engagement approach. This required a steep learning curve, because alliance contracting was new to flood risk management in the Netherlands.

After the start of the alliance

Design track

The Graaf Reinald Alliance (GRA) started early July. Over the summer break, the involved parties got to know each other better and developed a joint project plan. The GRA started to collect the specific characteristics from the residents and to learn what was on their mind. The GRA organised 16 meetings, where the residents felt that they had already shared the requested information during the community meetings earlier that year, whereas the members of the alliance gained valuable knowledge which helped to shape the following process. The GRA divided the dike into 51 areas, and they inventoried for each area the wishes from local governmental bodies, businesses, residents and ensembles, and reported these insights in so-called factsheets. In addition, the engineers studied what the feasible solutions were for each area. The GRA then shared and discussed this information during walk-in meetings with the residents, and with the ELs, SBG, AMG and EMG. Their feedback was then integrated in the factsheets, forming the basis for the '*Notitie Reikwijdte en Detailniveau'* (NRD), which defined the process to come to a preferred alternative. In accordance with formal regulations, the Province put the NRD on public display for 4 weeks and solicited points of view. The GRA then gave written feedback on these points of views. Based on the responses and the feedback from the SBG, AMG and EMG the GRA paid additional attention to the social impact of the dike reconstruction, providing more information on how this criterion is taken into account. The GRA took the next step to inform residents when their property might be affected due to the dike reconstruction during so-called 'kitchen table meetings'. When the engineers had done their home-work, the GRA organized new walk-in meetings aiming to provide overall information on the preferred alternative throughout the 23 kilometres.

After consultation with residents, SBG, AMG and EMG, the GRA sent the preferred alternative to Rivierenland in accordance with the formal decision-making procedure, leading to a decision by the dike board on the preferred alternative on 16 October 2018. The EMG explicitly complimented the GRA for having chosen the path of community engagement and for being open and transparent throughout this phase.

Participation track

After the start of the alliance, the ELs continued to share information on the progress of the project, but also on how the ideas of the ensembles are taken into account. The alliance organised several 'tables' – among others on traffic, recreation and building policy – to discuss with municipalities, province, ensemble members, local residents and local businesses how the ideas of the ensemble could be brought further. In addition, the alliance and/or Rivierenland took initiative to discuss ideas with local businesses about their future plans, as some of these businesses were located in the crest or slope of the dike which might hinder the dike reconstruction.

In January 2018, the GRA organised a broad meeting for all ensemble members to inform them on the taken steps in realising their ideas. This time, the role of the ensembles, especially of their leaders, shifted from generating ideas and developing a vision to seeking opportunities for bringing their ideas further.

After the start of the GRA, the distinction between the design track and the participation track was more difficult to make. The stakeholders felt friction between the intensive community engagement process and the consultation meetings. The residents felt that they could not distinguish what was new information. As a result of the participation process, the alliance communicated openly and transparently, and shareholders literally looked over their shoulders. In their communication, the alliance used several infographics to show all the design steps to ultimately arrive at the preferred alternative. At the end of November, the Delta commissioner, who is, as outlined in the Delta Act, responsible for the DFPP, expressed that ´*What you have put together here is a great inspiration for others. We are not finished yet. You still have many years ahead to work together. I will spread this excellent example throughout the country*' (Graaf ReinaldAlliance, 2018).

4.2 Framework in action

Having outlined the GoWa project, we now turn our second research question: can we observe and diagnose the three types of social mechanism that can explain the success of knowledge transfer and uptake (preconditions, barriers and failure mechanisms) under real time circumstances. In the three years that the researcher was involved in the GoWa case, she attended over 150 meetings, where she observed and diagnosed, and in some cases intervened, showing that the social mechanisms can indeed be observed and diagnosed (see Appendix B).

In this chapter, we focus on 14 threads of one or more knowledge interaction moments. We use the action research spiral with four activities, namely *plan, act & observe, reflect* and then *re-plan*, which is an iterative process involving researchers and practitioners acting together on a particular cycle of activities. The PT allowed the researcher to attend the meetings of SBG, AMG and EMG. In AMG and EMG meetings the researcher only observed and diagnosed. In the community engagement arenas, she took a more active role in designing the process and supporting both the PT and the ensembles to share the available knowledge. The researcher was present during the group meetings of the Ensemble Haaften. She also attended – whenever possible – the two-weekly progress meetings of the PT, where among others the procurement was discussed. She also had regular trilateral or bilateral meetings with both context managers to share and discuss the chosen process design to help them facilitate the intensive community engagement approach. Figure 4.5 on page 72 gives an overview of the meetings the researcher attended. We used triangulation of questionnaires, interviews and documents to justify the observations and diagnosis.

To be able to observe and diagnose, the researcher was dependent on the openness of those involved. Throughout the research, we experienced that those involved were open to learn and see how they could reinforce each other. Such willingness to learn is important to continuously improve the processes around such complex projects. Knowledge transfer entails that there is a need, and communication takes place. The FODIKI framework assumes that the stakeholders are aware of the roles and needs of the end users. The researcher is confident that this learning process will continue until the end of the project, by continuously sharing knowledge in an open and transparent way. Interaction moments, typically meetings, can be complex, as different topics are addressed, and accompanying information is shared. We have seen that the information

can be shared during multiple meetings of varying group of participants, which makes observing and diagnosing difficult, which we will address later in section 4.7.

We selected the 14 threads of this chapter because they involve all the elements of the framework, and show the different barriers and failure mechanisms. In these interaction moments, the researcher only observed and diagnosed. We have seen that an interaction moment is exemplary for several moments, and therefore we will reference to other moments in the specific threads to show this.

We identify each thread comprising one or more knowledge interaction moments with a Roman number. We will use these numbers in the reflection and preliminary conclusions to refer to the threads. We describe each interaction moment following the same outline: (1) context of the situation, (2) observations during the interaction and, when relevant, also its aftermath, and (3) interpretation and diagnosis based on the framework. In each thread, we will refer to the researcher as 'she', and the other participants as 'he', regardless of the actual gender of the participants.

In section 4.3, we start off with two interaction moments in which no barriers or failure mechanisms occurred. We then proceed from three relatively simple interaction moments with only barriers occurring (section 4.4) to six more complex interaction moments with barriers *and* failure mechanisms (section 4.5). Where possible, we also identify different types of trust that influenced the barriers and failure mechanisms. In section 4.6, we see that interaction moments are more difficult to grasp, as we had to take multiple knowledge interaction moments into account, due to changes in preconditions over time.

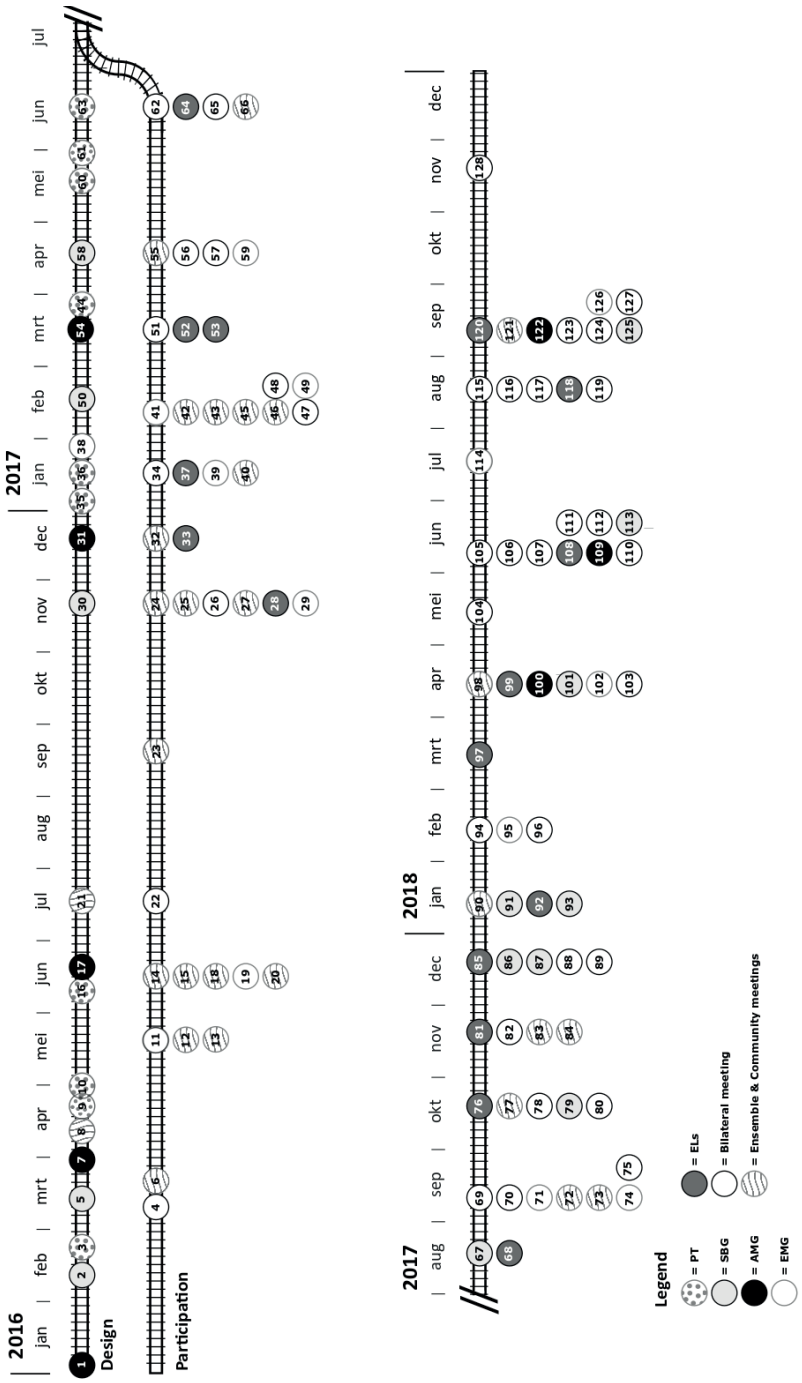


Figure 4.5 Overview of observed knowledge interaction moments by the researcher in the period December 2015 – December 2018. The numbers xxx in the legend refer to the numbers of the interaction in appendix B

4.3 Successful uptake of knowledge

In this section, we focus on two meetings of the sounding board group and executive monitoring group in different settings with different stakeholders. Both interaction moments show that participants could resolve barriers, resulting in a successful transfer and uptake of knowledge.

Thread I: Uptake during a sounding board group meeting (SBG)
Context: During regular SBG meetings, the chairman asked the sounding board group members for their opinion concerning the dike reinforcement. The SBG members reflected on substantive developments, but they also actively contributed ideas about communication with the residents and about the participation track. SBG members could also always propose new points for the agenda. Though uncommon, it did happen in this interaction moment (I_{30}). One SBG member proposed to share a presentation that he had given earlier to another SBG to tell more about public participation at GoWa. This other SBG monitors a programme that aims to make the river Waal and its surroundings more beautiful, safer, more natural and economically stronger. This interaction moment took place after the internal meeting (I_{29}) in which the ensembles had presented their ideas to each other.

Observations: The chairman starts the SBG Meeting with a brief review of the internal meeting. The chairman asks everyone to respond. An SBG member says that the RWA did not keep its word, as RWA executives attended the internal meeting, which was not the agreement. He says that ensemble members felt that they could not openly communicate their vision. Other SBG members agree that the intention was that the ensembles would present their progress to each other. The chairman explains that the PT is 'learning while facilitating this new and intensive community engagement approach, and that people of the RWA were very curious about the ensemble proposals'. SBG members remark that the RWA does not appear to be reliable, but they understand why the RWA invited the others. However, they ask the RWA to announce their 'listening in' in advance in the future. The meeting continues to follow the agenda. The last item on the agenda is the presentation of a SBG member about community engagement at GoWa. He starts his presentation by explaining the reasons for residents to participate in a civic participation process: 'The primary interest is about whether it is still safe for me (my family) (livelihood security); secondary interest is about a possible loss of control over my property (ownership) and of tertiary importance, is what happens in and with my living environment (appreciation of quality of life).'

He says that it is a hell-of-a-job to include all parties in such a process. He says that he knows from personal experience how difficult this is, after all, he works for a municipality in another domain. He tells that he has confidence in the expertise of the RWA around dike reinforcements, but that the project team sometimes should act faster because the SBG sometimes must wait a long time for something. He cites the communication plan, which was intended to clarify the tasks, roles and responsibilities of the SBG. He also points out that the RWA has taken a courageous step. 'I find it very daring, a RWA that was known to me as the most conservative stronghold in the Netherlands, autonomous in its way of working, that is now going to be on slippery ice, where other governments say that they have been working on community engagement for years,

and the RWA is open-minded and ask us to challenge them and keep them sharp'. In the presentation, he expresses his respect for the RWA and together he wants to step into it with confidence to make the participation process a success. After the presentation, the other SBG members react that the presentation gave a good overview of the steps taken by the residents and the RWA. The SBG members also agree with him that the way in which the RWA is open and vulnerable is to be praised.

Interpretation & diagnosis: Here, we distinguish two knowledge interaction moments. In the first, the SBG members (as senders) communicated their dissatisfaction of the presence of the RWA executives, with the context managers (as receivers). The SBG members said that there was no trust in the RWA.

Then a SBG member (S) shared his experiences with the participation process (K) with the other SBG members and the context managers (both R), in which he indicated what he experiences positively and less positively in the community engagement approach. The presenter said that the RWA is to be trusted, as the RWA works hard and try their best. Based on his presentation, we diagnosed that this SBG member had competence-based trust (expertise of the RWA) *and* competence-based trust in the PT and RWA (the vulnerability of the RWA around this community engagement approach).

The other SBG members agreed with his story and largely endorsed it. The fact that they asked the RWA to announce their 'listening in' in advance in the future suggests the uptake of the knowledge that the RWA is to be trusted to the level of *reference*. The presenter also realized that trust is important, as this could affect the SBG members willingness to share in the subsequent meetings.

Thread II: Possible relocation of businesses
Context: Within one ensemble, ensemble members proposed to relocate two companies that are presently on the river embankment. Residents view these companies as 'pustules of ugliness', located precisely at locations where the residents would like to restore the connection between river and village. This ensemble proposal is listed in the progress document with the ensemble proposals. Partly because of these proposals, the municipality, RWA, the landowner and one of the companies started discussions about the future. The ensemble members were not present during these discussions. The RWA wanted to inform them afterwards. The interaction moment we focus on is an EMG meeting (I_{94}) where the alderman concerned draws attention to this process. In this meeting, one of the agenda items is the progress of the ensemble proposals, and the progress document was attached to the agenda.

Observations: The context manager addresses several ensemble proposals from the progress document. He sketches the picture of a location being looked at in order to use the dike reinforcement to redevelop the site on the river embankment, exploring opportunities for nature, recreation and housing. 'The parties involved', as the context manager explains, 'are the municipality, the project developer, the company that is located there and the Rivierenland RWA. The promising variants are currently being worked out.' Some EMG members ask whether the process fits in with the exploration phase, since the relocation of a company is of great importance to define the dike strengthening at that specific place. 'The parties involved seem to have the will to find a solution; the necessary data are available, but there is still a lot of work to be done', says the context

manager. The alderman concerned says that he understands from his administrator that they suspect that the ensemble members know more than the municipality. First, the alderman wants to know from the RWA whether this is true and, second, whether the province is sufficiently involved. He says that the role of the province is not clear from the progress document that was sent with the agenda, and according to his administrator, this was not the case either. The context manager responds that the municipality attends all meetings with the company and the landowner, just like the RWA. The context manager says that after these meetings, the PT gives feedback to the ensemble members. He emphasizes that if the residents have more information, they did not receive it from the RWA. He also tells the EMG members that the province is indeed involved, but that this was inadvertedly not mentioned in the progress document. The context manager reaffirms the original agreements. The alderman says that he has confidence in the RWA, but that all kinds of rumours are currently circulating in the village. His administrators also send a signal that they feel that not everything is being shared. The context manager says that he will act to reaffirm the agreements on administrative level and to discuss the current state of affairs with the administrators. The alderman consents with this approach and states that he expects that both governmental organizations will have the same expectations of the planned process.

Interpretation & diagnosis: The alderman (R) had the need (N) to know how the alliance communicated with the regional partners and the ensemble around the possible relocation of businesses. The context manager (S) shared the knowledge (K) concerning the process approach and communication with those involved. The trust precondition was still met, as the alderman said he still had confidence in the RWA. The alderman's persistence in expressing their concerns over and over again, and his clarifying questions about the followed approach both suggest the occurrence of a *transmission* barrier (no communication). In his response, the context manager explained the approach again, while emphasizing that the PT followed the earlier agreed approach with the alderman's administrators. In an attempt to mitigate the barrier, the context manager agreed to transparently communicate with the involved administrators about the process. The reaffirmation of the earlier made agreements, suggests that the uptake level of K reaches *effort*.

In threads I and II, the involved stakeholders required additional information to better understand the knowledge shared. The basis of trust in the sender was important. Most apparent was the receiver's action to share meta-knowledge (*feedback*), to be able to start using the shared knowledge.

4.4 Singular interaction moments

In this section, we present simple interaction moments in which some barriers and failure mechanisms occurred. Our aim here is to see whether we can diagnose these timely.

Thread III: Provincial road: differences in definitions
This thread highlights how a cognitive barrier can create a misunderstanding that lasts for several meetings. It shows the importance of clearly defining concepts when working in an interdisciplinary setting.

Context: One ensemble had proposed to make the crossing of the provincial road N830 near the village Tuil safer and to construct ecological verges to further improve road safety. After the board conference (I_{59}), the province told the RWA and the alliance that they intended to carry out major maintenance on the N830. In the past one and a half year, the province and the alliance had several meetings where they discussed the possibilities, to link both projects. In the last meeting, the province informed the alliance that with 'major maintenance' they only meant a new layer of asphalt on the current road, and that further coupling is not feasible. In preparation of an ELs meeting (I_{96}), the context manager comes to the researcher and tells his experience of that meeting. Observation of this thread was indirect as the researcher did not personally attend the meetings between the alliance and the province.

Observations: The context manager reports that the province and the alliance had several meetings to discuss the possibilities to couple the major reconstruction of the N830 and the dike reconstruction with each other. He says that he tried to share the idea of the ensemble Tuil-Waardenburg of the ecological roadsides with the province. 'In the last meeting', he says, 'the province surprised me, as they told me that they only mean a new layer of asphalt on the current road. We thought that 'major maintenance' meant something more radical. This insight means that we do not have to combine our work'. The researcher responds that, even though the message of the province was disappointing, this is a beautiful example of a cognitive barrier.

Aftermath: The context manager and researcher agree to communicate as soon as possible to the ELs about the misunderstanding between the province and alliance. In the ELs meeting (I96), the context manager takes the opportunity to maintain trust by communicating the message as quickly as possible, meanwhile emphasizing that the alliance gives transparent comments on whether ensemble proposals have potential, as was promised at the start of the community engagement process. The Els react disappointed and regret that the narrow scope of the major maintenance had not been made clear before, but they indicate that they are happy with the alliance's commitment in taking the ensemble proposal forward. Eventually, it turned out that the idea of the ecological verges of the ensemble could be fitted into the new design of the provincial road N830 near Tuil, as reported in ensemble progress report, version 4.0 dated 21 June 2018.

Interpretation & diagnosis: This is a prime example of a *cognitive* barrier occurring. The province (S) and the alliance (R) had two different perceptions on the term 'major maintenance'. A semantic distortion between the two parties occurred. The positive reaction of the ELs in (I_{96}) suggested that, despite the message of the context manager, the trust increased due to the open and transparent feedback.

Thread IV: Realism or dreaming about the vision on the dike by an ensemble
This thread shows how important it is to repeat shared knowledge in one's own wording to enhance the uptake by new receivers.

Context: At the kick-off meeting (I_{13}) of the ensembles, the context manager asked the ensembles to give their vision of the dike: 'We ask you to think about the dike with a focus on the environment. As a regional water authority, we know how to design dikes. The RWA stands for strong dikes. You do not need to have a technical training, nor to calculate geotechnical profiles or the length and thickness of a sheet piling. However, we do ask you to help us think about the context surrounding the dike'. The context manager gave the commitment that if later in the process, the ideas should turn out to be infeasible the RWA would openly and transparently explain on why they cannot be honoured. He gave examples such as costs and legal restrictions. During the kick-off meeting, the chairman of one particular ensemble asked why everyone wanted to participate in the process, and the residents reacted that they want to improve the liveability in the vicinity of their homes, but also that they want to be the first to know about the progress in the dike reconstruction to be able to use it for their own interests. At the kick-off meeting, time was too short to sketch together possible images for improving the living environment. After this meeting, a resident stepped forward to be EL, and planned a follow-up meeting. This meeting (I_{20}) was attended by 15 residents, including one SBG member, but not by any PT members. Our observations focus on how the ensemble members shared their ideas to increase the liveability of the dike.

Observations: The EL opens the meeting saying that because last time the meeting was noisy, and also because he sees a few new faces, he proposes to do another short introductory round. The members say that they have both personal and general interests to participate. After this round, he tells that right before this meeting he briefly spoke with one of the context managers of GoWa. This context manager told him that the diversity is great in every ensemble, and suggested to develop broad ideas that the designers can take as a starting point. Some members of the ensemble ask what exactly the intention is: 'Are we allowed to dream, or should we suggest only (financially) feasible ideas'? Both the EL and SBG member say that 'dreaming is allowed, but to get our ideas implemented, they must also be realisable during the dike reinforcement project, and the costs must be manageable'. They stress that for this moment they should not think in terms of all possible limitations. They suggest that inspiration can be drawn from, for example, other dike reinforcements. Some ensemble members say that they do not know how to strengthen a dike, so how can they come up with ideas? An ensemble member with a technical background says that the ensemble does not have to design. He repeats the question of RWA in his own words and stresses that 'they can make proposals about how the surrounding area can be made more beautiful and that the engineers should make sure that this is possible'. In the remainder of the evening, they sketch their ideas to increase the quality of life on two geographical maps. Some participants say that they think that their ideas do not fit with the institutional frameworks of both the RWA and the municipality. After some encouragement by the other participants, they share and write down their ideas, as dreaming is still allowed.

Aftermath: The EL organises several more ensemble meetings to discuss each other's ideas. In the meantime, ensemble members search the internet for applications that

are similar to their ideas. One ensemble member proposes to construct a bike path made from solar panels. He thinks this idea fits well with the sustainability objectives of the regional governments, and he shares a video showing that in the United States of America people are already experimenting with this. Other proposals are to make more hiking trails in the flood plains, to make jetties for the fish association at various places, and to place benches to look out over the river.

Interpretation & diagnosis: The EL (S) tried to transfer to the members of the ensemble (R) process knowledge (K) concerning what and how the PT wanted the ensembles to work on. The EL stepped forward as the initiator of this process and wanted to work hard to collect ideas from the group and bring them further in the design process. The ensemble members often have personal drivers to participate in the process, but also want to increase the liveability around their homes. That participants proposed ideas showed their *willingness to share*. That the ensemble members openly shared their ideas and all ideas were put on the maps, suggests that the trust precondition was also met.

The questions raised by the ensemble members suggest that the role of designer/ advisor did not fit with their self-image (*psychological* barrier). In addition, the ensemble members at first did not believe in the community engagement approach, believing that the PT would not have sufficient financial resources. This suggest that the ensemble members foresee the *resources-related* failure mechanism. This barrier and failure mechanism were mitigated by the explanation of the SBG member and EL. The ensemble took the ideas, written down on the maps, as a starting point during the subsequent meetings, which suggests that the uptake (U) reached the level of *effort.*

Thread V: Misunderstanding due to one word

In this thread we highlight our most striking observation that barriers can occur due to the misunderstanding of only a single word. When this remains unnoticed, such barriers can persist throughout a meeting and have negative consequences for the interpersonal trust and integrity-based trust.

Context: An AMG meeting usually takes place after an SBG meeting, and paves the way for the EMG. Normally, the AMG members will inform their directors about the agenda items. At the start of a meeting, the AMG members can add agenda items. During this particular AMG meeting (I_{17}), an AMG member adds the agenda item 'Agenda EMG'. One of the context managers replaces the project manager who normally chairs these meetings.

Observations: The first substantive item on the agenda is the most recent version of the Safety Analysis, which indicates the dike failure mechanisms on which the dike failed to meet the statutory standards. Under this agenda item, the chairman states that the content has not changed compared to the previous time it was discussed at the AMG meeting. He indicates that this version will first be discussed in the Flood Risk Management committee in July, after which it will be formally adopted by the Executive Board. One AMG member reacts agitatedly and asks what the role and responsibilities are of both the AMG and EMG. The other AMG members indicate that they trust that the safety analysis has been carried out correctly, because this is the expertise of the RWA. They do not understand what their added value is on this point. They also indicate

that they expected to hear more recent developments on this agenda item, because why else put it on the agenda? They urge the project team to be transparent on the changes in documents and agenda items compared to previous meetings. Now they feel as if the RWA places the ball in the AMG's court, whereas they expect the RWA to guide them in the project progress. The context manager responds apologetically that they are still searching for the right approach. The chairman then continues with the substantive agenda of the meeting. For each agenda item, the AMG members ask questions about exactly what is expected of the AMG and EMG. When dealing with the 'EMG agenda' item, the context manager indicates that they do not have a draft agenda for the upcoming EMG meeting. The AMG members react furiously: was it not agreed from the start that the AMG was the gateway to the EMG and that the rhythm of SBG-AMG-EMG would be followed? Then the EMG agenda should be ready in draft form to be discussed during the AMG meeting. The chairman agrees that the EMG agenda should be a standard agenda item in the future. When he adds that the meetings in this stage are not critical, one AMG member reacts strongly and questions the usefulness of the meetings. Despite the turmoil, all AMG members actively and constructively think along about the possible agenda items for the EMG meeting. This leads to a draft EMG agenda. After the meeting, the chairman and context manager discuss with the researcher what happened during the meeting. The researcher cannot point out the problem, but she promises to listen to her audio recording of the meeting and give feedback afterwards.

Aftermath: Listening to her recording, the researcher tries to determine at what point the meeting became more 'hostile'. It appears that the mere mentioning of the word 'July' is crucial. In Dutch, the term 'you' and 'July' are pronounced the same. When the chairman outlines (as sender) what the approval process will look like in the month of July, the AMG members (as receivers), wrongly got the idea that they should play a role in this, and got work shoved onto their plate.

For the next meeting, the context manager, in consultation with the project manager, circulate an annotated draft AMG agenda, in which he clearly indicates the purpose of each agenda item, and which decision items they, as project team, propose for the EMG. In addition, the PT sends a draft agenda for the EMG along with the draft AMG agenda. The AMG members express their compliments for this approach during the next meeting, because they could properly prepare this meeting for each agenda item, and prepare an annotation for their executive for the upcoming EMG meeting.

Interpretation & diagnosis: Here, the roles of senders and receiver changed throughout the meeting. First , the chairman (S) shared process knowledge about the approval process of the safety analysis (K) with the AMG members (R). R's need (N) was to know whether this safety analysis had been drawn up carefully and thoroughly, as AMG members were also formally responsible for this. Initially, the preconditions were met, as the AMG members openly shared their knowledge. Later, the AMG members (now as sender) shared information to draft an EMG agenda with the context manager (now as receiver). The sender had the competencies and expertise and was keen to share them, but was surprised that the draft EMG agenda was not on the AMG agenda. R's need was to have an EMG agenda that expresses the most important topics for that moment.

The unfortunate communication of the chairman around the word 'July' created a *transmission* barrier to the intended message, causing confusion and indignation. The suggested role as reviewer of the Safety Analysis report made the AMG feel that they were being asked something they could not live up to. They felt that they had neither the necessary knowledge and competences, nor the time required (because of summer holidays). As the chairman did not notice the transmission barrier in time, the misunderstanding grew into a *psychological* barrier, resulting in a more reactive stance of the AMG members, as they lost trust in the project team.

The interpersonal trust and integrity-based trust was lowered further when the AMG members discussed the EMG agenda. The para-verbal and non-verbal behaviour indicated that the AMG members had limited confidence in the project team's process approach. The AMG members gave *feedback* (role reversal) that they wanted the PT to prepare the EMG meeting before the AMG meeting, such that in the AMG meeting the most important discussion points could be discussed and prepared. The PT agreed to pick up the gauntlet for the next meetings, ensuring that the AMG members were willing to share their knowledge. In the aftermath, we saw that the PT carefully prepared the EMG meeting before the AMG meeting, suggesting the uptake of that process knowledge reached the level of *adoption*.

4.5 Compound interaction moments

In this section, we see similar social mechanisms occur as in the previous section, but now they are more complex because the preconditions are influenced by preceding meetings.

Thread VI: Executives: expectation management around community engagement
This thread shows that barriers can be persistent and persist in later meetings, with even a change in the level of benevolence-based trust.

Context: The PT shaped their community engagement approach. As the PT phrased it 'the product of the ensembles is, of course, a convincing design, which fits in the environment like a tailor-made costume'. The ensemble ideas, were, where possible, considered in the re-design process of the dike. When their ideas cannot be honoured due to criteria, the PT promised to give the ensembles a transparent explanation of why their ideas cannot be realised. The PT first explained their planned community engagement approach to the SBG members. There, they also discussed the changed scope of the project, as now the entire 23 km must to be reinforced. The SBG advised that the regional governments work side by side to realize this project. The SBG was enthusiastic about the community engagement approach, hoping to increase the liveability and pled for their involvement in the construction phase. Based on the comments of the SBG, the PT made some changes to the planned approach, before sending it to the EMG members. During the EMG meeting (I_8), the PT informed the executives about the planned community engagement approach.

Observations: The EMG-chairman opens the meeting, and gives the floor to the SBG chairman. The SBG chairman says that the SBG members were shocked that the entire 23 km dike must to be reinforced. He asks the PT to invest in careful communication

with the public, and emphasizes that the SBG would like to see the RWA, provinces and municipalities act together in this, thus giving a joint signal that the necessity of the dike reinforcement is evident. The SBG chairman adds that the SBG is pleased with the community engagement approach, as they see opportunities to increase the liveability. He says that the SBG requested that the municipalities should strongly be involved in the implementation plans for the ensemble ideas. The SBG members also want to remain involved throughout this project until the new dike is constructed. The EMG members react that they understand that the change in project scope must be communicated carefully and agree that they will – where possible – act jointly. One alderman says that he understands that his organisation should be connected to the implementation plan of the ensemble ideas, but that he has additional questions concerning the role and responsibilities of the EMG members in the community engagement approach. In response, the EMG chairman says that this is well laid down in procedures and refers to the process outline written by the PT, but he fails to make explicit which decision-making criteria are used and by whom. The alderman takes a more reactive stance, and says that the approach conflicts with the municipality's way of working. He states that he feels that he has little or no say in which plans of the ensembles will be realised. He asks for expectation management, so that the residents will know that not all plans can be realised. He also asks understanding from the EMG that because his municipality is involved in two dike reinforcement projects, he cannot make a financial commitment in one project and not in the other. The other EMG members say that they understand the position of the EMG member.

Aftermath: In the next EMG meetings, the same executive continues to recall the point of expectation management around the realization of ideas from the ensembles. He also asks the SBG chairman to report, especially in the SBG meetings, that not all ensemble proposals can be honoured. The PT reacts that they communicate open and transparently if and why certain ensemble ideas cannot be realized. The alderman persists, while indicating that the RWA cannot honour some specific ensemble ideas as the RWA does not have the formal authority on these topics, for example the relocation of businesses and road safety. The PT agrees, but stresses that they will openly communicate with the ensembles.

Interpretation & diagnosis: Here, the PT, who wanted to outline the process for community engagement approach (K1), and the SBG chairman, who outlined the advice of the SBG on both the project scope and this process approach (K2), both acted as S, towards the EMG members (R). The N of the EMG members focused on the progress of the project and their own role in this process. As the EMG members openly shared knowledge, the preconditions appear to be met. The defensive attitude of one alderman suggests a *psychological* barrier, because the approach conflicted with the normal way of working of the municipality.

In subsequent meetings, the EMG members further discussed the community engagement approach, which suggest the uptake reached the level of *reference*. The same alderman continued to insist on expectation management in later meetings as well, stressing that the RWA does not have the formal authority for certain ensemble ideas, suggesting the persistence of the psychological barrier.

Thread VII: (In)sufficient capacity at the municipalities
This thread shows that the FODIKI framework will not reveal whether knowledge is not taken up for strategic reasons. These cases are difficult to pin-point, as under such circumstances, stakeholders would not show their cards.

Context: Three municipalities are merging, and the executives and administrators expect to successfully complete the merger by 1 January 2019. Therefore, they did not have time to focus on other projects. One of these municipalities had, besides the GoWa project, another dike reinforcement project in its area, where a discussion took place whether a side channel would be realised. In this municipality, the work pressure was so high that many administrators were out on sick leave. The responsible administrator for the GoWa project had already changed several times. In or after the EMG meetings, the executives talked about the impact of this merger. Here, we specifically look at an EMG meeting (I_{94}) where, like the previous thread, the SBG chairman commented on the last SBG meeting. In this EMG meeting, the executives refer to the held board conference (I_{59}) (cf. chapter 5, thread VIII). During the board conference, a compilation of 25 ensemble ideas were presented, and for each proposal, the executives were asked to consider whether the proposal fits with their own policy programmes and whether they saw possibilities to take the proposal steps further, in which it is expected that an agreement with other governments is required. The set-up of the board conference was discussed in several bilateral meetings between the RWA and the co-governments, including the preceding EMG meeting (I_{49}).

Observations: At the request of the chairman, the SBG chairman gives feedback from the last SBG meeting. He explains that the SBG members are concerned about the capacity of a specific municipality. He says that 'during the board conference, an alderman indicated that he wanted to examine several proposals from the ensembles to see whether they are feasible. Unfortunately, his administrators lack time or are ill, and hence the planned involvement of the municipality has not taken place'. The alderman in question responds by emphasising that he has two dike reinforcement projects, and no financial reservation was made for any opportunities to combine with the dike strengthening projects. He says that the municipality simply does not have the capacity to actively contribute ideas. He says that he believes that the RWA has called this to itself because the local authorities are not involved in the ensembles, and also that he believes that a lack of clarity exists on what will and will not be realised. He repeats his desire for clear expectation management from the start. He goes on to say that he continues to disagree with the intention of the board conference to bring ensemble ideas further. The other EMG members actively dispute this image, as they endorse the approach of the RWA. They say that 'the RWA has very clearly communicated the rules of the game, and all of us together as EMG have agreed to this'. They also note that they had embraced several themes and had agreed to look at whether these themes could be taken further, possibly including financial agreements. The alderman in question keeps repeating that he experienced the set-up of the board conference differently. He says that during an earlier EMG meeting (I_{38}), which took place more than a year ago, the RWA and DFPP promised that additional capacity could be made available to the municipalities, but until now no agreements are made. He has a defensive attitude, when he cites from the EMG minutes of January 2017 and claims that the first meeting will not take place until one

month after this current meeting, more than 14 months after that EMG meeting. The RWA reacts with a more nuanced story, as the Dike Strengthening Programme Manager explains that the RWA has asked the municipality last year to provide an estimate of the hours required. He says that in the response of the municipality, they asked for additional support for the necessary permits, but no bottlenecks were identified regarding the further development of the ensemble ideas.

Interpretation & diagnosis: The roles of sender and receiver change throughout the meeting. At first, the SBG chairman (S) informed the EMG members (R), and in particular the relevant alderman (R), about the apparent shortage of capacity at the municipality (K1). The trust precondition appeared to be met, because the EMG members openly shared their ideas with each other. The alderman (as S) explained the role of the municipality in the two dike reconstruction projects and his perception of the community engagement approach (K2).

The alderman took a reactive stance, while explaining his position and interests. On the basis of his behaviour, the researcher concluded that the alderman cannot oversee the various ways in which the ensemble ideas may affect his interests. In a response to the alderman, the EMG members gave feedback (fb) that they disagreed with the alderman, and that they fully support the RWA in their community engagement approach. The alderman persisted in the meeting that he cannot agree with the approach and that he also has insufficient resources, both in time and required hours, which suggests the occurrence of a *psychological* barrier. Moreover, the alderman seemed to be the only one unwilling to accept that the EMG discussed the expectations of the ensembles well and that the EMG members had accepted the process approach.

Similar to the previous thread, the same alderman persisted in his wish for expectation management, but now the other EMG members disagreed with him. The alderman then focussed on the promised additional capacity, where it appeared as if the alderman was trying to put the blame on the PT by suggesting that the PT had not taken any action to facilitate the additional hours required for the administrators in his municipality. The alderman had a defensive attitude, and his lack of knowledge of the developments on the administrative level suggested that he acted to protect his own interests, brushing aside any message that he sees as undesirable. In this way, he can defend himself in the future when decisions must be made about the ensemble proposals.

Thread VIII: The creation of a new family of river dikes

Context: Here, we analyse the EMG meeting (I_{102}) during which the Graaf Reinald Alliance showed their progress in developing a preferred alternative for the dike to the EMG members. Two years earlier, the same EMG members gained more insight into the design process during an EMG meeting (I_{21}), when the technical manager presented the design steps for the dike reconstruction. After that presentation, an EMG member asked questions about the role his organisation could play as an involved co-authority in weighing up the various alternatives. At the time, this question was insufficiently answered, but the EMG chairman promised that it would be clarified. The alliance aimed to learn which criteria of the, earlier discussed, assessment framework the EMG members considered important, so that the alliance could take this into account in the further development of the Preferred Alternative.

Observations: The alliance manager informs the EMG members that his colleague will present the steps taken to develop a preferred alternative, and that before he starts, he wants to highlights two things: (1) in the presentation, we will introduce the concept of 'creating a new dike landscape' and (2) that after this presentation the EMG members will have a 'stomach ache'. The colleague then begins his presentation and tells that, with the new design guidelines and the new legal standards, the dikes will have inner berms of about 50 metres long, and that the current dikes will also have to be raised by approximately 1 to 1.5 metres. The presenter states that this dike reinforcement seems to create what they call 'a new family of river dikes'. He explains that the engineers themselves were shocked by the necessary interventions to make the dike comply with the legal standards. The EMG members are visibly shocked by the visualisations of the future dike. At the end of his presentation, he shows a 3D film of the future dike, in which the current houses are also projected in; the roofs of these houses rise just above the new dike.

The EMG member, who two years earlier (in I_{21}) asked the question about the role of the co-governments, repeats his request to learn what his role is. He indicates that the approach shown is strongly driven by the engineers. A second EMG member agrees. Both advocate a more careful consideration of the impact of dike reinforcement, and they wonder if and how this is taken into account at this very moment by the alliance. Both EMG members state that 'the impact on the residents living near the vicinity of the dike is enormous. The first step that should be taken is to look at what is going to change outside, instead of being on the drawing board'. The Province offers to work with the RWA on this. An EMG member asks to what extent the design rules of the dikes are fixed, because he understood that a new version would be available later this year, and whether this would have spatial consequences for this design. Two EMG members want to see how this project-specific approach fits in with the approach for the entire river Waal. The chairman initially reacts that the RWA controls the process and brushes all concerns aside. The two EMG members strongly disagree. The chairman feels supported by an absent EMG member and reads some points of view from his email: 'Time is an important aspect and the project should not be delayed too much'. The alliance manager also says that he still strives to complete the preferred alternative this autumn, according to schedule. These comments are counterproductive for the EMG members. One EMG member tells the chairman that the EMG is unanimous in its desire for a different approach. The chairman continues to adhere to the approach outlined above. The alliance manager then takes up the gauntlet and proposes a process how the alliance could work with the concerns expressed. He asks whether this approach is in line with the ideas of both EMG members, and they agree. This concludes this agenda item and the remainder of the EMG's agenda is followed.

Aftermath: The Provincial administrators actively share Provincial policy with the alliance members. In the next EMG meeting (I_{101}), the same presenter showed various visualizations of the Province to indicate how the approach fits with policies of the co-governments.

Interpretation & diagnosis: During this interaction moment, the presenter (S) shared substantive knowledge (K1) about the development of the preferred alternative to the EMG members (R1). After the presentation, the roles reverse, as the EMG members (now

as senders) shared what they found important in weighing the different alternatives (K2) to the alliance (now as receiver (R2)).The original need (N) of the EMG members was to learn about the progress of the project and in which direction the preferred alternative seemed to go, and where it would affect their interests. The need of the alliance focused on learning the most important criteria for the EMG members for developing the preferred alternative. The EMG members expressed their concerns, which the researcher interpreted as that they openly shared knowledge, which suggests that the preconditions were initially met.

The reaction of the EMG members to the future dimension of the dike suggests the occurrence of a *cognitive* barrier. The response of the EMG members to the enormous impact that the dike reinforcement has on the dike residents and their social cohesion suggests the occurrence of a *psychological* barrier. A transmission barrier occurred when the RWA said that they want to finalize the preferred alternative in the autumn, and therefore initially rejected the comments of the EMG members. During the meeting, EMG members had less confidence in the chairman because (a) he was unable to allay the concerns and formulate clear action points, but also (b) he was unable to adhere to his own process design. The EMG members expressed doubts about the validity of the design rules, while discrediting these rules (*diffidence* failure mechanism). They also indicated that approval of this project-specific approach would set a precedent for the entire river Waal, resulting in a possible institutional failure mechanism. At the end of the meeting, the alliance manager asked for meta-knowledge of the EMG member to verify that the proposed action fit their needs. In this way, the alliance manager regained trust from the EMG members for the process. It seems that in sessions where predominantly substantive knowledge is shared, feedback should be asked among the participants to ensure that the preconditions are met throughout a meeting. By connecting to the receiver's needs, the sender can safeguard the receiver's trust in him and the shared knowledge.

The uptake of the shared K1 reached the level of *reference*, as the EMG members later refer to this specific meeting and the gained knowledge. The uptake of the shared K2 reached the level of *adoption*, as the alliance members incorporated the concerns and important weighing criteria in the next version of the preferred alternative

Thread IX: Internal evaluation of the tender procurement procedure
Professional trust in one organisation appears to be vital in 'getting things done', as we will see in this interaction moment.

Context: The Dike Strengthening Programme Team requested an evaluation of the tendering process for the dike reinforcement. As the chosen contract form was new for the RWA, they wanted to evaluate the process well to be able to include the lessons learned in the following projects. Various interviews were conducted for the evaluation. The evaluation (WSRL, 2017) showed that the knowledge transfer between the different teams within the RWA was sub-optimal. The purpose of this meeting (I_{36}) was to co-construct the lessons learned and possible improvements together. The meeting was designed such that first the experiences would be shared with each other and then the lessons learned would be jointly formulated. The participants were the members of the Programme Team, PT and the Legal Department. Unfortunately, one of the PT

members was absent, as he indicated earlier that day, during the project team meeting (I_{35}), that he was giving priority to something else. He indicated that the procurement process 'was not his thing'. The project manager came from another regional water authority and the current project was his first within the RWA. At his previous employer, the formal hierarchy was important, whereas at this RWA, coordination takes via the informal hierarchy. The chairman of the afternoon was a RWA colleague who conducted the evaluation of the tendering process via interviews and paper trace.

Observations: The chairman of the afternoon indicates at the opening that it is important to share things openly with each other during the consultation. He gives a brief introduction of the experiences gained through the interviews. He briefly outlines with whom he had discussions, and then gives others room to share their experiences. The chairman says that 'the evaluation shows that the entire tendering procedure was a search, which did not always make it clear who had what responsibility and where it ended'. The Programme Team Manager admits that he sometimes stretched his responsibility if he did not understand a specific part properly. He explains that he wanted to understand the matter well, after which it is not always possible to make decisions. During the meeting, the participants openly discuss what they desired and what was lacking during the process. The project manager says that he continued to focus on the necessity of formal control lines. He tells that the PT felt that they had a certain mandate of their own, but when the choice for the alliance was made, a different situation arose, and that the Programme Team had insufficiently pronounced these changes in responsibilities. He keeps stressing the necessity of formal control lines. Other participants, including his project team members, react visibly annoyed and make hand gestures when the project manager continues to focus on the formal lines. The other participants try to tell the project manager that 'in the RWA most decisions are taken around the coffee machines'.

One participant points out that several choices had to be made while drafting the tender documents, for example regarding risk allocation and the earning model. He says that 'both the programme team and the lawyers were not able to oversee what the financial consequences could be of certain choices. This made decision-making difficult'. Another participant says that 'we struggled with the organisational structure and the relationship and coordination between the alliance – where some of the RWA employees would be working in the coming years – and the regional water authority itself. Colleagues had conflicting views around the financial model'. The chairman indicates that this was confirmed in the interviews. The lawyer admits, the legal department deliberately skipped several hierarchical lines. Partly due to the absence of colleagues during the summer holidays, they went directly to the board to force a decision, in favour of their point of view, to guarantee progress. The attendees also mention examples that delivering certain documents on an agreed day did not mean that 17:00 hrs is a good time since you then oblige the other to work in the evening. The participants agree that everyone involved had an enormous work ethic, and did their utmost to realize everything, but that the communication about mutual expectations was suboptimal. They jointly formulate concrete points for improvement around several themes, including the approach and planning for complex projects, the method of management and decision-making for complex projects, and quality assurance and review.

Aftermath: Six months after this session, the researcher presents her PhD research to the Dike Strengthening Programme Team, to further explore the added value for the RWA. In this session, the research points out that the reflection document of GoWa's tender procedure contains important points of attention, but that she suspects that no one has read the document, except those present at the reflection meeting. The attending team members confirm this diagnosis.

Interpretation and diagnosis: During the meeting, the roles of sender and receiver changed. The chairman of the meeting initially acted as the receiver (R1) because he wanted (N) to record the lessons learned (K1) in the final report of the evaluation of the tender. The participants were the senders. At the same time, the participants (as R2) wanted to learn (N) from the experiences. In this session, by sharing their personal knowledge, they jointly develop new insights for further projects. That the participants openly shared their ideas and experiences shows their *willingness to share*.

During the meeting, the participants sketched the struggle to preserve and safeguard the core values of the RWA in the alliance. The participants said that the organisational structure between the RWA and alliance – inherent to this type of contracting – required a new way of working and required coordination. At that time, the participants were unable to adapt, which suggests that *psychological* barriers occurred in this process. The project manager repeatedly mentioned the importance of formal hierarchy, as he was used to at his former employer. During the meeting, we saw a psychological barrier occur, when the participants tried to explain the importance of the informal hierarchy in this RWA., because such action was incompatible with the current practices of the project manager.

To be able to evaluate these kinds of processes, trust is a crucial variable in knowledge transfer and subsequent uptake. Despite that the chairman had said that everything can be shared openly, trust was not always present. The attendees sometimes had during the meeting a closed and defensive attitude. The researcher interpreted the absence of one of the project team members as that the tendering process was not seen as a team effort. In addition, the project team members did not support the project manager when he drew attention to the formal hierarchy, suggesting lack of support for the project manager. We saw that individuals were continuously learning about the alliance and the interpretation of RWA in the tendering process. The alliance as a form of contracting was new, which means not only that individuals learn, but also teams, and ultimately an organisation (this is comparable to the innovations in the KIS project (section 3.4). The insights gained by the researcher in the KIS project helped the researcher to observe and diagnose. The necessity to learn throughout the different layers of the RWA organisation was insufficiently recognised by all participants during the tendering process. When the RWA opted for alliance contracting, the RWA colleagues paid insufficient attention in the distinction of the roles between the project team and programme team. As a result, the mutual trust within the project team, but also between the project team and the programme team, came to a standstill and declined. The example that the legal department took an unusual step for them to go directly to the board supports this diagnosis. The uptake of the shared lessons learned reached the level of reference as the chairman added them to the evaluation document. The uptake of the lessons learned for the participants reached the level of *reference*, as no other alliance contracting were

initiated in the RWA, and (b) no one besides the participants seemed to have read the evaluation document, as was confirmed in the aftermath.

Thread X: Trust between professionals: Co-construction of a document
Please note that we want to protect those involved from possible consequences of their willingness to be open and to learn. This research is based on the presence of mutual trust between the participants and the researcher. We also want to prevent that this research leads to adverse consequences for those involved, especially because the RWA is a learning organisation and wants to continuously improve. Therefore, the following thread has been anonymized to protect those involved and the sources used. The example, however, is illustrative of the importance of mutual trust between those involved in such projects. This thread also clearly shows several failure mechanisms, and thus the functioning of the FODIKI framework.

Context: Every two weeks, the project team had a progress meeting where all kinds of matters were discussed to ensure the progress of the project. At the start of the project, agreements were made about the way in which the project team members communicate with third parties within the RWA. It was the (unwritten) rule that signals concerning progress and content should first be shared within the project team and only then to the outside world. Each project team member had his own contact person within the Programme Team in accordance with his task. Prior to each project team meeting, the agenda and accompanying documents were circulated. This interaction moment describes the iteration about a document that becomes part of the tender procedure for the alliance. During the previous project team meeting the table of contents was established and the tasks within the team were divided so that all knew who would deliver which part. At the same time, a deadline was set for the submission of the elements of the document to the project manager. At the next project team meeting, the document compiled by the project manager would be on the agenda to check that it was complete. Well before the project team meeting, the project manager sent the latest version of the document by e-mail and put it on the project disk. He indicated once again that he would like to know whether the knowledge contained in the document was complete. During this specific meeting (I_9) this document was on the agenda.

Observations: The interaction moment starts when a PT member comes in a few minutes late to the meeting. He apologises for being a little bit later, but he has just come out of a meeting with the internal clients of the project. He sits down, takes a deep breath and says: 'there is a bomb under the project'. The others are visibly startled. He explains that he has just sat around the table with two colleagues, discussing the planning, the progress in the contractual agreements and the possible division of roles between the parties. During that meeting, he had shared his own concerns with respect to these topics. His interlocutors, the internal clients, shared their main concern, namely that for the DFPP the dike has to be reinforced before a certain deadline. The interlocutors also put forward a few suggestions to meet the planning, and suggested to hire an external party to give advice on the division of roles between the RWA and private parties in the alliance. The PT member says that he felt that his interlocutors have interpreted his message differently, given their reactions.

Then the meeting (I_9) continues, as the other PT members are visibly upset with this reaction from the other meeting, and take a reactive stance. The other PT members say that they feel that the PT is speaking with two mouths, as the unwritten rule is not followed. One PT member says that when they draw up the new planning, they did not yet consider the duplication and optimisation moments. Moreover, they agreed that the planning would not yet be shared outside the PT. These PT members ask the question 'to what extent can we be confident that the information will be communicated properly'. One of the PT members says that it is as if we are going back on agreements we made earlier. He proposes to 'remain firm, because what else would our own decision-making procedure mean?' All team members fully support the schedule issued at the end of June. They agree with each other that all deadline moments will be met. They agree that some team members will smooth out the schedule and appoint actions for the end of period until the tender.

Next, the PT members address the notion of hiring an external party for an advice on the division of the roles of the parties involved, which results in naming one particular external party. One PT member reacts puzzled, as he indicates that he lacks information about the usefulness and necessity and the steps to be taken. He says, that they had previously agreed that the RWA would draw up a document and that the next step was for an external party to review this. He also indicates that he does not understand why this particular external party is invited for this. After some explanation from one of the team members the misunderstanding is resolved. After a short discussion, all team members agree that the communication should be clear and concise, but that there is a necessity to design a process, where they realise that not all reactions and proposed changes can be taken into account.

After this, the chairman follows the actual agenda of the meeting. The chairman repeats his request to check the completeness of the document. Several team members indicate that they did not have time to read it through. One member indicates that it is not clear to him why and for whom this document is being written. These questions give rise to a revival of a discussion held during the previous meeting. Moreover, the participants who *did* read the document indicate that additional subjects have been added to the document, and are displeased that PT members did not properly prepare for this meeting. A team member explains that he added these topics because he felt that they were important when he was writing. The other team members react piqued that this was not in accordance with the agreements of the previous meeting. The content of several topics could be placed elsewhere, but not in this way. The attendees express that they increasingly do not follow the made agreements, with could endanger the planning.

Aftermath: A week after this meeting, the researcher presents (I_{10}) her PhD research and preliminary results to the project team. The participants also reflect on the kick-off of the team meeting. A team member indicates that 'if possible, steam would have come out of his ears'. He says that they agreed when what would be communicated outside the PT, but that the PT did not live up to that. This team member indicates that sometimes matters are decided in-between meetings that are not communicated. He believes that he is not always properly connected, which leads to a reactive attitude from his side. The researcher addressed the importance of mutual trust between the professionals, and said that restoring trust is a delicate process.

Interpretation & diagnosis: In this interaction moment, we saw two noteworthy knowledge transfer moments to point out. First, we discuss the kick-off of the meeting when the last team member comes in (A) and then when the vision document is discussed(B).

(A): The team member (S) transferred process knowledge to the other team members (R). When both the contractual agreements and the division of roles of the parties involved were discussed in more detail, the roles were reversed. The team members had the need (N) to hear the progress of the project and to know how the influential internal clients reacted. This specific team member had the need (N) to learn whether their progress fitted with to the desired progress of his interlocutors. When he entered the PT meeting, he had his mind on the previous meeting. Through the para-verbal and non-verbal communication, the researcher observed that the PT members, in order to clear his mind, he had to share his experiences and emotions.

Because of their role in the PT, the other PT members disagreed with the knowledge the PT member shared with his interlocutors, since they felt that the team member did not keep to their agreements, and therefore they rejected his approach, suggesting a *psychological* barrier. The suggestion that the PT member spoke with two mouths, suggest a lack of trust of the team members in this PT member. The PT members as receiver found the transferred knowledge less trustworthy, leading to a change in the preconditions for uptake. Moreover, some PT members felt that decisions were made in-between meetings, and that they were not included, resulting in an adverse effect on the willingness to share precondition and thus on the mutual professional trust between the PT members. The uptake (U) did not extend beyond *cognition*, and therefore no uptake took place. During the aftermath, the researcher said that restoring mutual trust (T) is a delicate process. The first step for the PT member is to reassess the common ground, in which 'the common ground as a larger umbrella term serves to refer to all the knowledge/beliefs which an individual hold to be mutual/shared with another individual' (Lee, 2001).

(B): At this moment of knowledge transfer, the chairman (R) wanted to know of the other team members (S) whether the document was complete. He had communicated his need (N) in various ways, first by e-mail, and orally when discussing the agenda item. The PT members openly shared their opinions, suggesting that the preconditions for transfer and uptake were met.

In this interaction moment, we saw the cascading effect of the previous PT meeting, resulting in both an barrier and failure mechanisms. Firstly, it emerged during the meeting that a PT member had added extra - not discussed - topics to the document. The other team members understood why the PT member added these topics, but because of their role and made agreements they could not agree with the content, suggesting a *psychological* barrier. Secondly, despite the made agreements of the previous PT meeting, a few team members indicated that they had not read the document due to a lack of time. The uptake of the procedural knowledge, discussed at the previous meeting failed, as the sense of urgency had not lasted long enough for them. This hindered progress and had an impact on this interaction moment, and is an example of the *resource-related* failure mechanism, since time was the limiting factor. Thirdly, we

saw that one team member seemed to have forgotten the knowledge he had previously transferred about the purpose and target group of the document, which is a form of *dissipation* failure mechanism. As a result, a discussion that had already taken place in the past started again, leaving less time to discuss the content of the document. Overall the team members were also piqued and upset, indicating a loss of trust (T), and this loss of trust can affect the preconditions on the sender's side to transfer knowledge, but also the precondition for uptake in subsequent meetings.

Thread XI: Partnership between alliance partners– old knowledge imbedded in their practices

In this thread, we see that when new people get involved in a project, the former employees must make extra effort to explain the informal rules-in-use to the newcomers. If this is not done carefully, it can result in consequential damages, for example a decrease in the trust of the stakeholders in the responsible project team.

Context: Forming an alliance for a dike reinforcement project is quite unique in the Netherlands. In the tendering process, the consortia had to develop an action plan that would allow a 'flying start'. The RWA assessed the action plan as part of the tender procurement procedure. In parallel, the project team continued to work on the project to ensure that the dike was reinforced before a certain time frame. After the final award of the project to the Waalensemble consortium, the alliance partners (RWA and private parties) sat down around the table to determine their jointly plan of approach, because both the RWA and the Waalensemble had already worked out their own plans of approach in much detail. Moreover, the private parties had their own ideas on how the proposals of the ensembles could be taken further, and as information was gathered during the tender procedure, the RWA was unable to record all information and considerations in the tender document. At the time of the start of the alliance, both plans had to be brought together. The participation process, started with the ensembles was an intensive process, which is experienced as innovative by all participants. The basis of the participation process initiated by the RWA was to put the resident first. This process is one of the most far-reaching forms of public participation in dike reinforcement (DFPP, 2017b). This means that newcomers cannot rely on their own working practices. During this process, the RWA and the ensemble leaders had initiated informal institutions and expectations about the subsequent steps when the alliance would start. This tacit knowledge was not laid down in documents. Each alliance employee came from a parent organization with applicable working practices and core values. However, these core values are not applicable one-to-one on the alliance, and working in an alliance requires that certain values be set aside and that the values of the alliance be applied. Our observations focus on a trilateral meeting (I_{103}) between the alliance manager, the context manager and the researcher, where the alliance manager and context manager spoke about the start of the alliance.

Observations: The alliance manager describes that each colleague within the alliance has three personalities, as an administrator, as a role within the alliance and as an individual. *'*As an administrator, someone works from their parent organisation, with corresponding core values. Within the alliance, someone has a role to fulfil with accompanying tasks and responsibilities. Finally, someone is an individual with their own standards and values. On these three personalities friction can occur.'

The alliance manager continues and tells that they saw that that someone said: 'I know exactly what the community engagement approach is like and how it should be'. This person, however, did not have the role in the alliance to enforce his vision, resulting in tension between alliance colleagues. The alliance manager says that the tension was partially caused due to the 'flying start' as the new colleagues got to know each other 'on the fly', whereas building trust takes time. In addition, the alliance partners did not agree about the way in which they want to continue the ensembles. The context manager explains that the consortium had the idea that with the 'vision of the ensembles on the dike', the ensembles could be dissolved. 'After all, there was enough information to enable the alliance to move forward'. The alliance manager tells that the context managers from the very beginning indicated that dissolving the ensembles was not possible. 'At the start of the ensembles, it was said and promised that the project wanted to take the ensembles towards the implementation and keep them informed'. Moreover, she tells that the context managers shared on several occasions their knowledge about the (in)formal rules of the community engagement approach, after which the others said that they understood the knowledge.

The researcher tells the alliance manager and context manager that she observed during multiple information meetings. She observed that the alliance colleagues sometimes disqualified a colleague in conversations with residents, by saying that he did not have the appropriate knowledge to talk about certain topics. In addition, she mentions that the alliance colleagues sometimes shared more information with residents than had been agreed upon beforehand. She warns the others that this could lead to different flows of information, and loss of trust of the residents in the alliance. Especially as she has seen residents ask the same question repeatedly to the different alliance colleagues present during an information meeting, hoping to gain more knowledge, than was already told by the alliance colleagues.

Aftermath: During a regular ELs meeting (I_{76}), an EL indicate that the suggestion that the ensembles will stop is not positively received by the ensemble members. In this meeting, the ELs point out that they are ambassadors for the GRA, and that the alliance should make good use of this. A few months earlier this was still confirmed by the RWA, they say. In the next SBG meeting (I_{79}), the SBG members agree with the ELs that the ensembles are ambassadors for the GRA, and should be utilized throughout the project. They also state that they disapprove that the discussion on the possible role of the ensembles within the new phase of the projects takes place in the informal circuit. They warn the alliance of possible 'ghost' stories.

Interpretation & diagnosis: This is an example which shows how difficult is to join a project after its start. The alliance jumped onto a moving train of public participation. A process that had already started, cannot be changed just like that, especially if commitments have been made. This meant that newcomers cannot simply follow their own working practices. Based on the observations of the researcher (cf. chapter 5, thread IX) and the notion that the new approach had been shared several times, we saw that that the newcomers had understood the knowledge but still had difficulties adopting this new working method, as the old knowledge seems too deeply imbedded in their current practice, which refers to the *institutional* failure mechanism. They had to learn about the new, changed way of dealing with residents that the project team was able

to do earlier, step by step. The potential dissolving of the ensembles led to a defensive attitude of the ELs and SBG members, as they saw an important role for the ensembles until the implementation of the project, as ambassador in the community, suggesting a *psychological* barrier.

In this section, we have seen different types of trust between professionals, and between public parties based on their public office. We also saw that barriers and failure mechanisms in a particular interaction moment can have consequences for future interaction moments. These mechanisms determine the preconditions for knowledge transfer and uptake in the subsequent interaction moments. Especially the precondition *willingness to share*, which is coupled to trust, can be affected.

4.6 Cascading effects

In this section, more complex interaction moments are described. To determine the successful uptake of knowledge, it is necessary to consider a chain of interaction moments. The variety of failure mechanisms becomes clear when several interaction moments are observed and diagnosed. To be able to diagnose these moments, repetitive use of the framework was required. These moments were also characterised due to the cascading effects of the chosen process design and on the preconditions.

Thread XII: Process design prevents knowledge transfer
Context: During the EMG meetings, the PT examined where the dike design can affect the interests of the other authorities. Via the EMG, the executives can exert influence. The competent authorities, such as the local councils (Dutch: *gemeenteraden*) and the Provincial-Executive (Dutch: *Gedeputeerde Staten*) ultimately take the formal decisions. To prevent the competent authorities from being surprised by the developments, the PT informed them from time to time. For example, the PT send the newsletters and invitations to walk-in meetings to the clerks, who took care of further distribution within the local councils. The ensembles were in full swing to share the vision they have developed with community members and administrators. In this specific interaction moment, we saw how the project team made and applied a process design after an alderman in the EMG asked whether the local councils can be further informed about the project and the intensive community engagement approach.

In the EMG meeting (I_{21}), an alderman asked whether the local councils could be informed about the participation process and project progress. The underlying reason, as he explained, was that the three local councils have a formal responsibility in the granting of permits and necessary zoning plan changes. His request was supported by other EMG members. The EMG chairman agreed and asked the project team to take the necessary actions. After the meeting, the project team made a standard process design for the three council meetings to be planned, consisting of a general presentation about the project, in which not only the project size, the necessity of the dike reinforcement, the alliance as public-private partnership, but also the chosen community engagement approach was explained. The PT intended that each ensemble would present their vision on the dike in its surroundings. The context managers supported the ensembles to ensure that each ensemble had a comparable presentation in terms of structure. For this, they used the ensembles' shared motto and slogan 'the dike is from all of us'. Each

local council was thus zooming in on the dike section that was relevant to them, and the most relevant one or two ensembles would be highlighted. The first opinion-forming council meeting was quickly planned, and the approach was briefly coordinated with the involved alderman and the administrator. The local council reacted enthusiastically to the process design and content. The chosen approach worked well, and another presentation was given at the second local council. However, at a subsequent EMG meeting (I_{38}), one alderman proposed to send written information to his local council instead of giving a presentation. Nevertheless, a date for the opinion-forming council meeting was later agreed and recorded with the alderman. The alderman had questions about the approach, which led to various bilateral consultations to discuss everything. The alderman fulfilled the role of initiator and host.

Prior to the last opinion-forming council meeting (I_{55}), the alderman told the context managers and the ensembles that a few topics were 'out of bounds' and should not be discussed. He said that they cannot share their ideas around an industrial park. If they do share their ideas, the alderman said he would stop the meeting directly. The context managers did not agree and tried to persuade the alderman, but he persisted, and after a while the context managers complied with these conditions. The ensemble members were visibly furious, but also agreed to these conditions. The ensemble members and context managers jointly wrote the message of the presentation around the industrial park. The ensemble member could therefore read the text in such a way that he would not say things that the alderman had said were 'out of bounds'.

Observations: The context manager starts by introducing the dike reinforcement project, he informs the local council on the recent developments of the project, and briefly explains the community engagement approach that the PT had started, almost a year ago. Then he gives the floor to the ensemble members. One ensemble member starts with mentioning the ideas for a certain area without a cheat sheet, but when he reaches the industrial park area, he looks at his cheat sheet, and says that he will read the ensemble ideas from this cheat sheet. After which he says the prepared message out loud, while showing the map where all their ensemble ideas of the industrial park area, including the sensitive knowledge. A member of another ensemble then continues by highlighting their ensemble ideas. After both presentations, the local councillors ask several explanatory questions. Some local councillors ask whether the presented ideas are in line with current developments within their municipality. The context managers respond positively to this. Other local councillors compliment the RWA with their community engagement approach and say that their municipality can learn from it. The ensemble members also state that they did not share all their ideas due to time constraints, but that the ideas they *did* present are feasible.

Interpretation & diagnosis: The context manager with the presenters from the ensembles (both S) shared information with the council members (R). The need (N) of the council members was to learn more about the dike reinforcement project, the community engagement approach, and what role they, as council, will play when. Because the alderman stated that only available knowledge minus sensitive knowledge may be shared, the precondition of *freedom to share* was affected. He exercised his power, because he explicitly indicated that no knowledge may be shared about certain subjects. He threatened to end the meeting on the spot and veto it. The senders only presented

the knowledge minus sensitive knowledge. They did, however, send an implicit message to the council members, because they *did* show their ideas on a map that included their ideas of the forbidden area. The example showed that the exercise of power can impede the transfer of knowledge available.

Thread XIII: Ownership of knowledge between ensembles
In this thread, we see that a stakeholder can also, for various reasons, give 'conditions of use' to the knowledge. If the receiver does not comply with these conditions, the original sender loses his trust, which stands in the way of far-reaching cooperation.

Context: After the internal presentation (I_{29}) member of ensemble A asked a member of ensemble B if they were willing to share their slides, so that they could use them as inspiration for improving their presentation. He promised that he will not 'copycat' any ideas from their presentation. The member of ensemble B agreed and sent the presentation. During the preparation of the external presentation (I_{49}) for administrators, the PT held a trial presentation (I_{46}). Unfortunately, the planned presenter of ensemble A could not attend, so someone else from this ensemble attended.

Observations: The ensembles take turns presenting their ideas. The presenter of ensemble A starts with the presentation. When seeing and hearing the presentation, the ensemble B representative gets angry. After the presentation, everyone is allowed to react. The ensemble B representative is clearly irritated, and he says, that the following remark should not be taken personally, but that many visualizations and the outline of the presentation are literally copied from their presentation. He says: 'I oppose against this presentation as certain slides are stolen from our presentation'. The presenter of ensemble A says that he is unaware if slides are copied from the other ensemble's presentation but will of course modify the presentation. Next, ensemble B takes the floor and shows his presentation. Approximately four slides, that ensemble B presents are the same as ensemble A, namely around sustainability, traffic lightning, and cultural heritage. After seeing this presentation, the presenter of ensemble A responds that he understands the reaction of ensemble B and says that he wrote down which slides must be changed.

Aftermath: During the next SBG meeting (I_{50}), the ensemble member of ensemble A, being also a SBG member, tells that in-between the meetings, more tensions arose between the two ensembles and that people have sent angry mails, and that in the reactions people were personally attacked. He tells that 'the people involved sometimes take it very personally, while we eventually want to strive for the best for the entire 23 km'. He states that the environmental aspects like nature, recreation and ecology are more broadly valid, along the entire dike stretch. He says that the member of ensemble B does not seem to be aware of this. In the SBG meeting, other SBG members stress that ensembles do not compete for the realisation of ideas. The RWA confirms that this is not the intention, as the realisation of the ideas also depend on the co-operation of other authorities and parties whether the proposals are being realised. The researcher remarks that the ensemble member of ensemble A who requested the presentation of ensemble B, did not show up at the broad ensemble meetings for some time either.

Interpretation & diagnosis: The ensemble B (S) shared their slides, which they presented during the internal meeting between the ensembles with a member of ensemble A (R).

R wanted to use the presentation as a source of inspiration to make a presentation of A's vision. In an earlier stage S developed his vision on the dike around ensemble B. When sharing this knowledge, the representative of B set conditions for its use. The reaction of ensemble B's representative to the presentation showed that he claimed 'emotional ownership of knowledge' (Jones & Jordan, 1998). Usually sharing the knowledge implies the sender does not 'relinquish ownership of the knowledge, instead, it results in joint ownership of the knowledge between the sender and the receiver' (Ipe, 2003). By using this knowledge only for ensemble B, the ensemble hoped that more of their ideas would be honoured. Each ensemble aimed to maximize the realisation of their ideas, at the potential cost of other ensemble ideas, a zero-sum game between them. 'In highly competitive environments or those in which knowledge has high (commercial) value, there exists a dilemma resulting from contradictory incentives to share knowledge and to withhold it' (Ipe, 2003). The member of ensemble A, however, did not comply with the conditions of use. The uptake of the shared slides of ensemble B was high, as ensemble B had used the slides in their own presentation. The representative of ensemble B felt that the representative of ensemble A *incorrectly used* the shared slides, suggesting the incorrect use failure mechanism, after which the representative of ensemble B was less *willing to share* knowledge, suggesting leading to a change in preconditions. It seems that in the interaction moments described (after internal presentation, during trial presentation, and then via email) the representative of ensemble B indicated the ownership of knowledge. Norms and practices that stimulate individual ownership of knowledge appeared to impede the process of knowledge sharing within this community engagement approach. Through adequate intervention by a representative of ensemble A, the consequential damage was limited as an adjusted presentation was given at the external presentation.

Thread XIV: Ideas of an ensemble around an industrial park

Context: At the kick-off meeting (I_{13}) of the ensembles, during the introductory round, every ensemble member was asked why he wanted to participate in the process. The reactions differed: some feared the impact of the dike reinforcement on their home, others worried about their quality of life. Emotions also came up because of the experiences of the previous dike reinforcement. Some residents felt that they 'were deceived last time', and wanted to start a protest movement to stop the current dike reinforcement. During the first meetings of a specific ensemble (I_{20}, I_{23}, I_{32}), a similar round of introductions was held to get to know each other better. During this round, the ensemble members indicated what they consider important, often concerning their own personal interest in dike reinforcement, but also traffic safety, nature and recreation and quality of life were frequently heard themes. The members asked questions about the 'difference' that the RWA can make. They said that various local initiators had developed plans in the past years, but the municipality had thwarted these plans, among others around a certain industrial park.

When sketching the first ideas, the ensemble members asked whether they can think 'out of the box', as described in thread 4 of this chapter. During an ensemble meeting (I_{23}) the EL indicated that he understood that the ensemble can think about 'out of the box' about the industrial parks and flood plains, as the ensemble is still in the idea phase. As there were plans to expand the activities of a logistics company, the participants felt strong emotions against a specific industrial park. These plans originate from a decade ago, and

the municipality had been working on changing the zoning plan for this industrial park, such that expansion is possible under certain conditions. In that period, the municipality involved residents at different moments in this process, but residents later framed this public consultation as a farce. In the summer of 2017, the municipality put the zoning plan on display, and anyone could submit their views on it. In December of the same year, the council formally adopted this plan, but this decision was still irrevocable.

The ensemble had developed various ideas for the industrial park. One of the ideas is to bring the dike along the current quay, such that the current houses will be spared during the dike reinforcement. Win-win opportunities were also seen by planting trees on the current dike in the future, making the industrial park less visible and audible. The ensemble also proposed senior housing on the crest of the dike, as residents experienced that there is a shortage of this type of housing. The ensemble regularly discussed whether you can 'decide' so easily on other people's land.

In this thread, we will describe three interaction moments: the ELs meeting, in which the EL reports on the developments around the industrial park and the role of the RWA, the overall ensemble meeting, in which the context manager and researcher have a conversation with an ensemble member of this specific ensemble, and another ELs meeting, where again the role of the RWA is being discussed around the industrial park. By highlighting these three meetings, we can provide insights in the cascading effects.

1. ELs meeting (I_{96})

Context: The alliance was currently in the transition from possible solution directions to promising solution directions in the design process. The ELs meeting (I96) that took place one day after the council meeting, is chaired by one of the context managers. The alliance has circulated a draft agenda in advance that is to be finalised at the start of the meeting. In this meeting, the ELs were asked to serve as a sounding board for how proposals from the ensembles can be taken further, but also how promising solutions can be brought forward and explained to the residents. The meeting is not attended by the EL of ensemble Haaften but by his substitute.

Observations: After the chairman has opened the meeting, the substitute for ensemble Haaften informs that the ensemble members feel cheated about the industrial park. 'The RWA said that we would have a say in this area for the future development' and he claims that this was confirmed at the board conference. He sketches the picture that the municipality will just march on, without considering the wishes of the citizens. The substitute asks what the relationship is between the RWA and the municipality. The chairman of the meeting tries to explain the difference in tasks and jurisdiction between the municipality and the RWA. 'In this specific case, the municipality decides on the expansion of a company; the RWA has no authority whatsoever in this respect'. The chairman also indicates that the RWA wants to be open and transparent about the decisions regarding the ensemble proposals in relation to the dike reinforcement. 'At some locations, the dike reinforcement will hurt, but we can make sure that when decisions are made about the reinforcement, the involved partners take all ideas into account and that residents are involved'. The substitute says that everyone in his community has the same feeling. In a response, the chairman indicates that the alliance has embraced the suggestion of the residents at a specific location in this community, while emphasizing

that it helped that the ensemble and the residents proposed this alternative. Another example where the ideas of the ensemble are being considered by the alliance is the proposed dike relocation at the industrial park, which is currently being considered as a fully-fledged alternative. During the meeting, the substitute tells that some ensemble members receive hateful letters. Due to that, he tells that 'some members have left the ensemble, and others are looking to find their grandfather's shotgun', looking for ways to stop the plans of the logistics company through legal proceedings.

Aftermath: Directly after this meeting, the researcher has a conversation with the substitute of the ensemble. He tells that some residents in this community really believed that by actively thinking along with the ensemble, they could stop the expansion of the logistics company. During later conversations with members of the ensemble, the researcher hears that the members are internally divided.

Interpretation & diagnosis: First, the substitute (S1) shares knowledge about how his community members experienced the process around the industrial park and how they felt about it. The PT (R1) had the need (N) to know how that community views these developments because this provides insights for their process approach. Conversely, the chairman (S2) intended to transfer process knowledge and to indicate that the substitute and his ensemble (R2) had already achieved a great deal. The preconditions for transfer and uptake were largely present, although limited the substitute appeared to have limited trust (T) in the RWA, as was seen in the para-verbal and non-verbal behaviour of the participants.

In this community, there was clearly a political context. The participation process that had been initiated by the municipality was later framed by the residents as a farce around the industrial park. In that sense, the process can be seen as a ritual dance (Van Twist & Van Rijn, 2009). Some residents of that community saw the interactive participation process of GoWa as an opportunity to ventilate their vision around the industrial park. They hoped that the process, initiated by RWA, might be able to stop the plans of the expansion of the logistics company. What the substitute and his fellow members did not realize or knew, however, is that the RWA did not have any formal authority regarding the possible expansion of a logistics company. The RWA tried to let the members of the ensemble focus on the win-win situations. This is in line with De Bruijn & Ten Heuvelhof (2002). In this case, that was possible as the project considered an additional alternative for the dike reconstruction- brought in by this ensemble, namely the dike relocation, where the current flood defence might be moved towards the river, thus minimizing the hindrance for the local residents. The level of uptake for this ensemble idea reached *adoption*.

2. Overall ensemble meeting (I_{103})

Context: During this meeting (I_{103}), the context manager and the researcher have a conversation with one of the ensemble members.

Observations: The ensemble member says that residents have started a crowdfunding campaign within the community to pay for the court case they want to bring against the municipality. He says that they also want to find out more information, and that is why they are working on a formal request to the municipality, and possibly also to the

RWA. He says that not everyone understands what the legal role and position of the RWA is. He understands that, based on its formal authority, the RWA cannot stop the expansion of the logistics company, even if they wanted to. That is why, as he tells, he focuses on the other, still feasible, ensemble proposals. He emphasises that he wants to ensure that the RWA does take the dike relocation into account when considering the preferred alternative around the industrial park. He also expresses his satisfaction that the by the ensemble proposed constructive solution at a certain location, is embraced by the alliance. He states that there are residents who want to hear nothing other than that the expansion of the logistics company will not take place.

Interpretation & diagnosis: In the second interaction moment, we saw that an ensemble member understood the role and responsibility of the RWA. Motivated by the interest of the ensemble to relocate the company, he wanted the PT to know that not everyone in his ensemble understood the formal authority of the RWA. The PT was curious (N) to learn more about the sentiment in the community. That the ensemble member proposed ideas and solutions showed their *willingness to share*. The trust condition was met, as they openly shared their ideas. No barriers and failure mechanisms occurred.

3. ELs meeting (I_{110})

Context: The EL of this ensemble attends this meeting (I_{110}) which took place after the municipal council had expressed its opinion on the zoning plan for the industrial area. In this meeting, the context manager wanted to carefully go through the ensemble process and also explain why some proposals cannot be realised

Observations: The EL of the specific ensemble asks several times why the RWA cannot simply make a phone call to the municipality about the industrial park. He says that he is disappointed, as he had expected the RWA to support their ideas and to actively convince the municipality to enter into a dialogue with the ensemble. The chairman of the meeting, the context manager, tries several times to explain how in the Netherlands the responsibilities and power are distributed over the municipality and the RWA. He advises the EL 'to focus on the proposals that may still be feasible. For example, the alliance still includes the relocation of the dike as an alternative, and proposals concerning nature and recreation in some flood plains are currently being worked out in more detail. These proposals all came from the ensemble'. Other EL members agree with the chairman, but the EL took a reactive stance.

Interpretation & diagnosis: The context manager fulfilled the role of sender, as he shared how the formal responsibilities between the RWA and municipality are organised, whereas the EL of a specific ensemble is the receiver. The need (N) for the EL was that the expansion of the logistics company will not take place. The preconditions for knowledge transfer are present as the sender is *willing to share* the knowledge. We assume that the preconditions for knowledge uptake are present, as the S and R openly shared their views, suggesting trust. Similar to the previous meetings, the RWA indicated that they do not have a formal responsibility in the expansion of a logistics company. Still, the EL repeatedly requested the RWA to play a role in the zoning plan and the expansion of companies, suggesting a *psychological* barrier. It appeared that the EL did not want to adopt this message, as it did not match their beliefs. The EL found this message as undesirable and tried to convince the RWA to play a role at all costs, suggesting the

strategic power play failure mechanism.

In the described three meetings, we saw that a certain message was not adopted by the receiver, despite the efforts of the sender. In these meetings, the RWA has tried to ensure that win-win opportunities are available in accordance with the design principles of de Bruijn & Ten Heuvelhof (2010), but some residents are not receptive for this message. They only focus on one specific element of their overall vision. Throughout these meetings, the trust precondition appeared to be affected, as the receiver appeared to be less willing to listen to and learn from others, resulting in cascading effects. The FODIKI framework helps to focus on recognising and (in advance) understanding why knowledge can or cannot be used and making a desired process design for this purpose.

4.7 Reflection and preliminary conclusions

Our focus for this chapter was to see whether the framework is applicable in a 'live' case under real time conditions. The described threads were relatively early in the community engagement approach, and the researcher was still learning how to use the FODIKI framework under real time conditions, and how to be able to quickly identify the barriers and failure mechanisms. We selected fourteen knowledge interaction moments where the researcher did not intervene. These threads show that with the FODIKI framework, we can observe indeed the social mechanisms in real-time:

Preconditions

- The precondition *willingness to share,* or at least the lack thereof, can be observed directly in the meetings. Generally, we found stakeholders both willing to share knowledge and transparent on their interests, but thread XIII shows that stakeholders can set limitations on the shared knowledge, leading to a partial knowledge transfer and uptake.
- The precondition *freedom to share*, or at least the lack thereof, can also be observed directly in meetings. In thread XII we saw that a stakeholder, who felt that his position could be affected by the knowledge, exercised his power to restrict the scope of K begin transferred.
- Knowledge *needs* result from the drivers or interests of stakeholders. Bearing these drivers in mind, we were able to observe them real time in meetings as they become apparent in behaviour and expressions of actors.
- In the threads, knowledge was often shared in two-way communication, meaning that the roles of sender and receiver reversed during the meetings. Sometimes the receiver asked questions for clarification, suggesting potential barriers, sometimes the receiver gave *feedback* (fb) (thread I and II), or they gave feedback on the shared knowledge, by giving their opinion and insight in what they find important around the shared knowledge, which answers the need of the other. In the successful interaction moments, we saw that meta-knowledge was actively shared, and helped to prevent barriers and failure mechanisms.
- Unlike in chapter 3, we were now able to observe *trust* because of the para-verbal and non-verbal attitude and behaviour of the stakeholders. In the threads, we observed differences in trust between professionals (thread II, X, X

and XI), between professionals and residents (I and VII), and between residents (I and XIII). For knowledge transfer and uptake, the basis of trust in the sender was important. Trust remains vulnerable and is sometimes difficult to observe, as stakeholders can act strategically, as we saw in thread VII; the FODIKI framework will not reveal whether knowledge is not taken up for strategic reasons. These cases are difficult to pin-point, as stakeholders then typically do not show their cards (De Bruijn & Ten Heuvelhof, 2010). In addition, the attempt to create better understanding of how and why knowledge transfer is hampered leads to an improved awareness of the importance of preparing knowledge sharing moments. A thoroughly prepared process design helps to stimulate knowledge sharing; otherwise a loss of trust can be the result, leading to a change in the *willingness to share* precondition (cascading effects).

Barriers and failure mechanisms

- In the first threads I and II, we saw that the uptake was successful, and no barriers and failure mechanisms occurred.
- In the singular interaction moments, we saw one or more barriers occur, and no failure mechanisms. Our most striking observation is that barriers can occur due to the misunderstanding of only a single word. When this remains unnoticed, such barriers can persist throughout a meeting and have negative consequences for the interpersonal trust and integrity-based trust.
- The *transmission* and *cognitive* barriers were relatively easy to observe and diagnose. In the described threads, such as III-V, the resulting misunderstanding was clearly visible. Thread III showed the importance of clearly defining concepts when working in an interdisciplinary setting, and thread VII showed that barriers can be persistent and persist in later meetings, with even a change in the level of benevolence-based trust.
- In thread V, the researcher was able to diagnose barriers and *in*directly observe a loss of trust, but only after she had relistened back the audio-recording to pin-point at what moment the meeting took the wrong junction. After in-depth analysis, it appeared that the misunderstanding of a single word led to loss of trust.
- For the *psychologica*l barrier, more background information is required about the manners, norms and values of the social group. It became easier for the researcher to diagnose these after she had attended several meetings and knew what primary interests were at stake among the various actors.
- To be able to identify *failure mechanisms*, the researcher also required background information on the stakeholders. In the described threads we diagnosed new failure mechanisms in addition to those observed in chapter 3. First, we saw that in thread IX, the researcher benefited from the experience from the case study Kinderdijk –Schoonhovenseveer for organisational learning of the RWA (section 3.4). In the same thread, we observed and diagnosed the *dissipation failure* mechanism for the first time. In addition, the *no-relay* failure mechanism was diagnosed twice based on different observations, thus enriching the observation – diagnosis combination. Furthermore, we also saw that at a higher level those involved behave more politically, which was often expressed in *psychological* barriers and resulting failure mechanisms (*strategic power play*).

In sum, the thread descriptions show that we have been able to observe the different determinants of the framework real time, and occasionally with hindsight, thus answering research questions 1 and 2 (chapter 1) positively. To make a diagnosis, it sometimes proved necessary to go through the observations again afterwards. In thread XII, the researcher required background information and more in-depth information about how bilateral meetings took place, to set a more precise diagnosis. This also had to do with the fact that initially the researcher was still learning to apply the framework in a 'live' case. The observer must therefore have a keen insight to be able to observe and diagnose. When real time diagnosis was not possible, the researcher often required additional response and feedback from other involved stakeholders. Still, an ex-post meeting intervention has added value as the lessons learnt can be used to prevent the same situation from re-occurring, as the process architect plans for a next moment.

In the next chapter, we will illustrate the different intervention possibilities, and we will answer the question whether the interventions taken also have an impact on knowledge transfer and uptake.

5 Reflection in Action: Categorization of interventions

Having concluded in the previous chapter that the FODIKI framework can be used for observation and diagnosis under real time conditions, we now focus on the effectiveness of possible interventions to enhance knowledge transfer and uptake. Similar to the previous chapter, the dike reconstruction project between Gorinchem and Waardenburg forms the backbone for this testing. We analyse ten interaction moments where we performed interventions, either when planning a meeting, live during meetings, or by re-planning after meetings, to prevent further cascade effects in a chain of interaction moments. We argue in this chapter that there is no 'one-size-fits-all'; each knowledge interaction moment must be observed and diagnosed in its context to take the appropriate intervention.

5.1 Categories of interventions

In the previous chapter, we already suggested several interventions based on our observations and diagnosis in the interaction moments described in the sections 4.3 – 4.6. To enhance the knowledge transfer and uptake, the researcher, based on the FODIKI framework, should create the required preconditions, remove potential barriers, and mitigate the failure mechanisms.

The most common interventions, so-called post-meeting interventions, are in line with the classical action research approach, where the researcher reflected with other participants after the meeting, or later, based on her observations and diagnosis, provided feedback and proposed interventions to prevent or mitigate the diagnosed barriers and failure mechanisms in a subsequent meeting. This is in line with the steps *reflect* and *re-plan* of the action research spiral.

This is in contrast with situations where the researcher performed a small action research cycle; observing, diagnosing and then intervening. The researcher either intervened in real time or by suggesting to another participant in the meeting to make one or more interventions, which depended on the role and position of the researcher.

By developing hypotheses, and sharing these *ex ante* with project team members, the researcher showed how the FODIKI framework worked. She predicted which different social mechanisms of the FODIKI framework would occur, among others the potential barriers for the meeting and future failure mechanisms in subsequent meetings. These hypotheses she sometimes shared with one or more parties involved, stimulating them to use the FODIKI framework, as we will see in chapter 6. She used the hypotheses as frame, making herself especially alert to observations related to the hypothesis. This type of intervention is a kind of 'quasi-experiment' (Cook & Campbell, 1979), and was aimed to learn, which interventions are effective in enhancing the knowledge transfer and uptake. In some cases she shared the hypotheses beforehand, enabling the stakeholder to adjust the process design accordingly.

Thread: Intervention during the three 'walk-in' meetings for residents (12 March – 19 May 2016)

To illustrate the classical action research approach, we start by describing how the researcher observed, reflected and re-planned three 'walk-in' meetings for residents, based on the FODIKI framework. In this thread, we did not make real time interventions, only after the meetings we suggested interventions to the project team.

Context: One of the first interactions of the researcher with GoWa was attending the informative 'walk-in' meetings for residents of the municipalities in the project area. Two years earlier, the PT had organised similar meetings to brief residents on the original plan to reinforce parts of the dike. The PT now planned 'walk-in' meetings ($I_{11 - 13}$) to address four topics: the necessity of reinforcement, the broadening of the project scope to the entire dike, the time line for the project, and the community involvement.

Observations: In the first 'walk-in' meeting (I_{11}), the technical manager (TM) highlights the public policies that govern dike reinforcement. He starts at the strategic policy level, referring to the national Delta programme and its underlying FRM philosophy. When he explains the new and stricter statutory standards, the national safety norm of 1 in 100,000 years as the acceptable probability of a fatality due to flooding sparks a discussion: residents argue that the likelihood of a terrorist attack is higher (terrorists in Paris had just killed over 150 people). By contrast, his summary of recent insights in the behaviour of dikes under extreme conditions is assented (in 2015, dike failure due to 'piping' had received ample media coverage). The TM tells the residents to envision the polder as bath tub that fills up rapidly in case of a dike breach, and then explains the dike failure mechanisms. The context manager (CM) then focusses on the community engagement plan, emphasising that the PT aims for a strong collaboration with the community. When the CM invites residents to team up with the PT and participate in the dike redesign process, the residents react reservedly, even sceptically, referring to their experiences during the previous dike reconstruction in the late 1990s. In that project, the RWA had not followed up on the community's wishes and ideas. Some residents recall a similar disregard in a participatory process organised by their municipality in 2014. The residents raise several questions on their role in, and influence on, the redesign process. The CM emphasises that the PT will transparently and openly ponder their ideas for inclusion in the design. Despite their reservations, most residents give the PT the benefit of the doubt. When the researcher asks about their motivation, the residents who registered to be involved mention their concern about how the project would impact their property and their living environment.

Interpretation, diagnosis and intervention: The PT acted as sender (S) during the meeting, where they shared technical, processual and procedural knowledge about the dike reinforcement (K). The residents (as receivers) had the need to learn more about the dike reinforcement project (N). The preconditions for knowledge transfer and uptake (N and willingness to share) appeared to be satisfied, but the trust precondition appeared not to be satisfied.

After the meeting, the PT used the FODIKI framework to reflect on the meeting's proceedings. The residents' response clearly indicated a lack of trust in the RWA, and their recollection of earlier participatory processes might pose a *psychological* barrier to

embracing the intensive community engagement approach envisioned by the RWA. The discussions also suggested *cognitive* barriers: without knowledge of probabilistic dike design, the concept of a 1 in 100.000 year probability did not make sense, and residents showed different frames of reference regarding the necessity of dike reinforcement. The researcher proposed to put more effort into transferring the necessity of dike reinforcement by (1) immediately focussing on the pragmatic reasons, notably the change of the statutory standards and the new insights on dike failure mechanisms, and (2) emphasising that dike reinforcement is not a local issue but benefits a hinterland with 300 thousand inhabitants. The researcher remarked that the residents readily took up the explanation of dike failure mechanisms as the TM had used visual language.

Aftermath: Putting these lessons into practice in the second 'walk-in' meeting (I_{12}) proved difficult. Skipping the Delta context, the TM now elaborated on the maximum river discharge as a key driver for reinforcement projects, but this also sparked discussion. This maximum had been changed several times in the past decades, based on political choices as much as on engineering calculations, and residents struggled with this subjectivity. Moreover, the TM – possibly because of his meetings with professionals earlier that day – now used much more technical jargon, and residents gave fewer signs of assent. Afterwards, in the reflection/re-planning session, the researcher encouraged the TM to focus even less on policy decisions, and to explain technical aspects in simpler terms. The third 'walk-in' meeting (I_{13}) went well. The questions triggered by each topic formed a natural bridge to the next, and the residents' questionnaire responses were quite positive.

This example shows a sequence of three action research cycles. It also shows that (re) plan interventions are not necessarily effective. We will come back to this in section 6.1, where we look at the knowledge transfer between researcher and project team. In the remainder of this chapter, we describe ten threads. In section 5.2, we describe threads in which the researcher proposes interventions during or after meetings, that we view as singular interaction moments. In section 5.3 we will focus on interventions related to the cascading effects across several meetings. These threads, again identified numbered using Roman numbers, follow the same outline as in chapter 4, but now comprise multiple knowledge interaction moments per meeting to show the uptake of the knowledge and the effect of interventions.

5.2 Interventions in singular interaction moments

We start with threads that illustrate diagnoses that called for simple interventions aimed at ensuring the preconditions, preventing or mitigating barriers and failure mechanisms.

Thread I: ELs meeting to shape the external meeting

In this thread, one context manager intervenes on the level of getting the message across between the participants of the ELs meeting. The researcher intervenes on a meta-level in the process design of the following meetings to ensure an effective knowledge transfer and uptake in these meetings.

Context: During an EL meeting (I_{37}), the context managers (CM1 and CM2) present the process design they have made for the external meeting (I_{50}) to the ensemble leaders, so that they can articulate their concerns and points of attention for this design. The aim of the external meeting is to share the ideas of the ensembles with representatives of the regional authorities, interest groups, companies and landowners, so that afterwards the PT and other regional governments can discuss how to link the ideas to existing plans of these organisations.

Observations: The context manager (CM2) kicks off the meeting by explaining the structure of the external meeting as a market place. 'On the market, the ensembles, as market vendors, offer their ideas as products to the representatives of regional authorities, interest groups, companies and landowners by first giving a short presentation in which the ensemble ideas are put forward. The evening will be led by a *ringmaster.*' For this role of ringmaster, CM2 explains, they have someone from the RWA in mind who is sufficiently known to those attending the meeting. 'The participants can then visit the market stalls to discuss and/or talk with the ensembles to bring the ideas further'. The ELs ask which participants are coming to the market. CM1 says that he is not sure who will be attending, but he believes that most stakeholders will be present as they had several bilateral consultations with the various stakeholders. The ELs propose two more additions to the list of invited guests, namely the Royal Dutch Touring Club ANWB and a logistics company based in Kerkewaard.

One EL expresses his concerns about inviting landowners. He tells that in the past they had the experience that a landowner immediately took his lawyer with him. CM1 reacts that he knows these stories, but that currently the process still is in the idea phase. The ELs also mention the fact that some people both have a personal and a business interest, which are sometimes difficult to reconcile. CM1 says that the project team is aware of this and that they try to take it into account. Some time later, the topic of the meeting changes to the way the ensembles can attract attention on the market of the participants. CM2 indicates that this can be done by specifically inviting organisations to visit their market stall. An EL says that they plan to offer a local delicacy in their market stall to 'lure' people. Some ELs also ask how they can prevent that the meeting will become a 'dead thing'.

Intervention: At this moment, the researcher makes the diagnosis that in the external meeting the ensembles will be competing for attention because they all want to speak to the same stakeholders, while it is to be expected that for each stakeholder only one representative will be walking around on the market. The researcher therefore proposes that during the external meeting the ringmaster and/or an ensemble member can invite specific stakeholders to their ensemble market stalls, thus ensuring that the ensembles can talk to for them relevant stakeholders. This would also make the evening more lively.

The participants think this is a good idea and CM1 says that he will take this suggestion into account when finalizing the design of the meeting. The ensemble leaders are also curious about the steps *after* the external meeting. They ask whether the ensemble working groups will be the implementors of an idea. CM2 answers that if there are matters that are not related to the dike reinforcement, other initiators than the RWA should be sought. He sketches the picture of an integrated design process where

residents, administrators and designers sit at the table. 'The PT wants to prevent ideas being dismissed without the ensembles knowing'. He says that the ensembles need to know why some ideas are impossible. One EL informs the others that in his ensemble working group they have someone who is knowledgeable about participation. 'This person indicates that there will be a transitional situation towards a new law. This means that the voice of the citizens will become more important'. The EL believes that with this law the residents are able to stop the expansion of a logistics company, against which there is much resistance with his community. He says that 'this [law] can mean positive things for this ensemble, for example for the proposed ideas around the industrial park in our ensemble'. CM1 says that 'it may be that an idea will not have an adopter, because strictly speaking an idea is not a worked-out plan'. CM2 indicates that it is important to organise the group of adoptors and to let them embrace the proposal. He hopes that an administrator will step forwards during or after the external meeting to investigate together with an ensemble whether an idea can be advanced. 'At the same time, this new law, the Environmental Planning Act, will not push aside the current political responsibilities, which means that citizens and governments should work more closely together in developing plans'. He emphasizes that the PT will take a role in advancing the ensemble ideas and transparently explain when they cannot be brought towards a realistic plan. After this, the context managers compliment the ensembles on what they produce and bring about, and say that this approach is also new to them and that they strive for an open process. One EL indicates that at some point the old tensions can come to the surface again. CM1 says that 'this can happen, but the most important thing is to deal with respect with the residents. And yes, we know that difficult conversations will be coming up. Sometimes the engineers do not have good arguments for the residents, but our aim is that the dike should once again be of use to residents'. The agenda is then followed throughout the rest of the meeting.

Aftermath: During the external meeting (I_{50}), several ELs indicate with whom they would like to exchange ideas in their market stall. On one occasion, the ringmaster calls for a particular ensemble to talk to a particular organisation. After the presentations of the ensembles, the context managers also introduce stakeholder delegates to the ensembles.

Interpretation, diagnosis & intervention: The context managers were the sender (S1) of the process design for the external meeting (K1) to the ELs (as R1). One EL (as S2) informed the other ELs and PT (as R2) on the potential of a new act for public participation (K2). The ELs wanted to know how their ensemble should prepare for this meeting (N1). The PT and ELs wanted to know how others perceived the new act and how this could help the ensembles in advancing their ideas (N2). The preconditions for knowledge transfer and uptake were satisfied: the knowledge was available in the interaction moment, and the CMs were eager to share the knowledge. Over time, interpersonal trust had been built up because the ELs had experienced that the CMs were working hard to advance the ideas, so that everyone shared their thoughts with each other.

At one point in the ELs meeting, an EL (as S2) shared how they interpret the approach when certain ensemble ideas cannot be realised. Based on this reaction, CM1 diagnosed the *diffidence* failure mechanism, as one member in an ensemble appeared to have disqualified knowledge transferred earlier by the PT (I_{33}) to the EL. In an attempt to

prevent that other ELs would take up this knowledge, CM1 (as R2) rejected the way the ensemble interpreted the Environment Planning Act (K2), pointing out the (formal) role of governments. This rejection is a sign for the *no-relay* failure mechanism, as CM1 decided not to take up the shared knowledge.

At some point, the researcher realised what the consequences of the competition for the participants' attention might be during the external meeting. Therefore, she suggested to make some changes in the shared script of the external meeting, aimed at ensuring that every ensemble could talk to the for them relevant stakeholders. In this way, the researcher intervened at a meta level to mitigate a transmission barrier inherent to the original script.

The used metaphor of a market was highly effective, as the ELs adopt it, and start reasoning from this metaphor, suggesting the uptake of the knowledge to the level of *adoption*.

Thread II: Prevent misunderstanding in an EL meeting

In this thread, misunderstanding plays a significant role. When a newcomer joins a meeting, the chairman might ask the newcomer whether he understands the used concepts. The researcher intervened on two levels: (1) directly in the meeting to mitigate barriers, and (2) by sharing technical knowledge in the meeting to make the participants aware of the risks involved, while applying innovations.

Context: In this phase of the project, the alliance gave insight into their approach to delivering a preferred alternative. The Scope and Level of Detail Memorandum (in Dutch: *Notitie Reikwijdte en Detailniveau (NRD*)) had been made available for review and anyone could submit their views on it. The ELs meeting (I_{96}) was attended by a new representative from ensemble Haaften. In previous meetings, the ELs indicated that they consider the application of innovations important. The agenda for this ELs meeting included the preparation of the 'walk-in' meetings for the NRD (I_{98}) as well as the progress made on the ensemble proposals. The alliance was seeking support for their planned script for the 'walk-in' meetings, where they wanted to share more information about the NRD and the required steps towards the Preferred Alternative. The alliance was working hard on the first steps towards a preferred alternative, and also wanted to give a 'look behind the scenes' during the 'walk-in' meetings.

Observations: Right after the start of the meeting, an EL asks questions about the spatial impact of the new dike. The chairman explains that the soil is heterogenous over the 23 km dike. 'In the design process, we proceed from coarse to fine, and at this moment the engineers told us that in the western part of the dike trajectory more softer soil layers exist, requiring longer inner berms'. An EL asks what this means, and the chairman tries to explain.

Intervention: At this moment the researcher makes the diagnosis that the explanation is not completely understood by the EL. The researcher intervenes by making a drawing of the dike to be reinforced, including the current dike and the dike to be built. The researcher makes a clarifying sketch, which provides a visual perspective.

The EL indicates that with the drawing the explanation of the chairman of the concept has become clear. The ELs then ask about the current state of affairs around innovations. The chairman explains that innovations are considered in specific parts of the dike reinforcement, and that the alliance will choose for specific techniques, including innovations, in the next project phases. The ELs continue to ask questions about the application of innovations.

Intervention: At this moment the researcher makes the diagnosis that the application of innovations is already seen by the ELs as a 'sacred grail', that will prevent nuisance. From her expertise, the researcher knows that the application of innovations is not a panacea because of all kinds of associated risks. She explains that sometimes innovations do not work, and that then other measures are still needed.

The way the ELs react to this intervention suggests that they are blind for these risks and only want to see the benefits, whereas the CMs agree. The message of the researcher is ignored. Next, the design and invitation of the 'walk-in' meetings for the NRD is discussed. The ELs react in a variety of ways: on the one hand they indicate that it felt like an obligation because of the legislation and regulations, but on the other hand they wanted to use this moment as a moment to highlight what the alliance is currently working on. The suggestion of an EL to include a planning of the dike strengthening project and write the invitation letter in plain language is taken to heart by the CMs. The ELs also say that the strength of the message lies in its repetition. When explaining the structure of the meeting and the space required for the new dike, the context manager mentions the concept of 'new legal standards' several times.

Intervention: At this moment the researcher diagnoses that this concept 'new legal standard' may not be known to everyone, because it is a professional term within the field of flood risk management. The researcher wants to prevent the emergence of a cognitive barrier, and therefore asks whether everyone knows what this term means, especially since it will be used in the invitation letter.

Most ELs react that this concept is sufficiently clear to them, also because they have already received an explanation about it during one of the earlier meetings. The new EL says that he does not know. The chairman explains the concept and says that he will also clarify this concept in the invitation letter. In addition, the ELs give contradictory views on the wishes of the residents: several ELs think that the turnout will be low, as all information is already known, while other ELs indicate that people do want to be informed, but that some of them will be disappointed because no additional information is given.

Aftermath: During the walk-in meeting (I_{98}), the ELs refer to the held ELs meeting, and express their compliments to the alliance for the chosen script for the meeting. They appreciate that the alliance adjusted the invitation accordingly to their given comments.

Interpretation, diagnosis and intervention: The context managers (S) shared the script of the 'walk-in' meetings in which the alliance would present the NRD and the steps towards a preferred alternative (K) to the ELs (R). The preconditions for knowledge transfer and uptake were satisfied: the ELs wanted to know how the alliance would present the progress of the project, the ideas of the ensembles, and the efforts of the

RWA to activate the residents in the 'walk-in' meetings (N). The knowledge sent by the CMs was trusted on the basis of their public office, and the belief that they perform this office following rigorous procedures. The constructive and open attitude of the ELs and CMs suggests that there was sufficient mutual trust (T).

During the meetings, the ELs (as R) gave several times feedback when they did not understand the shared knowledge. By sending this meta-knowledge, barriers for knowledge transfer could hardly occur. The researcher intervened in real time twice to prevent *transmission* and *cognitive* barriers from occurring, because the ELs did not know a specific term ('new legal standards') or could not imagine (*transmission*) how big the inner berms would become compared to the current dike (2d- sketch).

In addition, the researcher also shared her own expertise regarding the uncertainties of innovations, because of her diagnosis that the residents only wanted to see the positive aspects of innovations. In doing so, the researcher aimed to create a need by also showing the other sides of innovation. The reactions showed that this intervention was unsuccessful because of persistent worldviews of the ELs, and they appear not wanting to change their beliefs, suggesting a *psychological* barrier.

The uptake of the script of the 'walk-in' meeting reached the level of *reference*, as the ELs expressed their compliments that the alliance incorporated their comments and advice.

The researcher made similar interventions in I_{117} and I_{124}, where the concept of affected and non-affected houses seemed to lead to a misunderstanding. There, the researcher asked the participants to share their personal interpretation of the concept, after which the CM further elaborated about the definition of the concept. In preliminary meetings, the researcher also made suggestions to project team members to change maps to prevent the occurrence of misunderstanding on the part of the receiver, for example in I_{81} and I_{115}. In those meetings, the researcher observed that the alliance used the colour *green* for houses that probably did not have to be demolished, whereas this still depended on further architectural research, and the gardens and adjoining buildings might still be affected by the dike reinforcement. Usually, people associate the colour green that their property can stay 'as it is'. Therefore, the researcher intervened by suggesting using different colouring for these type of buildings.

Thread III: Internal presentation among ensembles

In some meetings, the researcher was not able to intervene directly. In this thread, we describe how in such situations the researcher intervened indirectly, and how, when they go unnoticed, barriers can persist and lead to more tense situations.

Context: In six months' time the ensembles had developed their ideas. After the kick-off meeting, they held several meetings to develop a vision together on their particular stretch of dike. The script for the internal meeting was discussed during an ELs meeting (to be analysed in chapter 5, thread VI). During the internal meeting (I_{29}), the ensembles presented their ideas to each other, and saw where these could be further enriched. This meeting was also attended by the SBG chairman on invitation by the ensembles.

Observations: The chairman welcomes everyone, including several project team members and an RWA executive, and the SBG chairman. The chairman says that these guests 'are all very curious about the progress and ideas of the ensembles'. This gives some murmur in the room, and some participants say that they are surprised about the presence of the RWA executive: 'Wasn't this supposed to be an internal meeting?!'. The chairman does not appear to hear this remark, and continues to outline the rules of the game and explains that the aim of the evening is to present the plans to each other. He emphasizes that the ensembles can make suggestions to other ensembles, but that no one should ridicule the ensemble ideas. After each presentation, questions can be asked or suggestions be made to the ensembles. The Linielandschap ensemble is the first to present its vision of the dike around Gorinchem and Dalem. Afterwards, a participant asks whether the ensemble has looked at the impact of making the dike broader. An ensemble member responds to this by saying that the idea of the ensemble is 'that when surface area is needed to strengthen the dike, the land owner should be compensated by getting land at the other side of his property. As a result, an owner will keep the same surface area he has now'. The ensemble wants the RWA to support the changes this will require to the zoning plan. Another participant asks whether the ensemble has ideas about being energy-neutral. The ensemble indicates that they do not have specific ideas. Before starting with the next presentations, the chairman repeats that all the ideas of the ensembles will be taken into account, and that in the unlikely event that they cannot be realised, this will be openly and transparently communicated. The next presenters are the ensemble Vuren and Herwijnen. At the end of their presentation, the same person repeats his question about being energy-neutral. In some presentations, ensemble members refer to ideas that they had heard from other ensembles, and they tell many personal stories that fit in well with the experience of the participants. There is also some overlap, as several ensembles want a marina, which gives rise to laughter. The presentation of the ensemble Hellouw – Haaften is relatively long, and at a certain point the chairman urges the presenters to speed up. This is partly due to the unexpected absence of a fellow presenter, as some of the ideas now have to be read off the map by the other two presenters. At the end of this presentation, a member of the same ensemble asks many questions. The presentation of the Tuil - Waardenburg ensemble is the last one. The presenter is visibly nervous, but clearly explains his story within time. In-between presentations, the participants point out several overarching issues that emerge from the presentations, such as sustainability and liveability. Another theme that receives a lot of attention in the presentations is street lights on the road of the dike. The chairman indicates that this is a theme that requires further elaboration.

At the close of the meeting, the chairman says that the number of ideas and suggestions exceeds his expectations. He has seen similarities between the ensembles, such as museums, marinas, fibreglass, sight lines towards the river, and traffic safety. He calls on the ensembles: 'Continue with your vision and elaborate it in more concrete detail, and make it even more beautiful.' One participant responds by stating that they lack the knowledge and capacity within the ensemble to further develop the plan. He asks for more help from the government, in this case the RWA, to bring it to a higher level. A somewhat heated discussion follows. The chairman indicates at a certain point that the call for capacity is clear and that the PT and RWA will take this into consideration. He also states that they left the initiative intentionally with the residents, because they did not want to make any value judgments about the feasibility of the ideas. The RWA executive

responds by indicating that he needs the support from his fellow EMG executives in order to realise the plans, as other governments are formally responsible for some of the mentioned themes. In general, he says, the executives are willing to advance the different themes, but they seek adopters.

Intervention: At this moment the researcher diagnoses that the ensembles and the project team are talking past each other, and that the expectations are mutually unclear. After all, the chairman's appeal suggested that the ensembles should elaborate their vision in more detail, when in fact the chairman meant to make a PowerPoint presentation and when applicable, to have this partly enriched by tonight's input, and to make artist impressions. The RWA executive also used words that did not match the language of the ensemble members. Noting that people shake their heads or show other negative body language, and adopt a closed attitude, the researcher talks with the SBG chairman about the need to manage all expectations, but indicates that she herself cannot intervene at this moment.

The SBG chairman then takes the floor and emphasises that the request of the chairman was to make the plans more beautiful, rather than to develop more and more ideas. He stresses that the main purpose is to translate the ideas to convince the next target group. The ensembles react positively to this. One ensemble requests a community consultation to obtain comments and critique on their ideas from within their community. The chairman replies that this proposal will be taken into account and discussed with the ELs. The chairman concludes the evening with a brief outlook for the coming months with the planned meetings involving the officials and executives.

Aftermath: The ensembles included elements of the other ensembles in their own vision. In some cases, elements were literally copied into their own vision (cf. chapter 4, thread XIII). Furthermore, the ELs and the context manager jointly discussed (I_{33}, I_{37}, I_{46}, $I_{52\text{-}53}$, I_{58}) the subsequent steps to share their vision to both the administrators and executives.

Interpretation, diagnosis and intervention: During the evening, the ensembles were mainly the sender (S1) of their own vision (K1), and the other ensembles and the project team were the receivers (R1). During the meeting, the preconditions for knowledge transfer and uptake were met. The need of the ensembles ($N1_E$) was whether their vision fitted in with the other ensembles and whether the project team would react positively. The project team was particularly curious ($N1_{PT}$) about the ideas and to see whether the process approach they have chosen is still sufficiently in line with the ideas put forward by the ensemble. At the end of the meeting, the chairman became the sender (S2) when he shared the outline (K2) for the subsequent steps after this meeting. The ensemble members (here as receiver R2) wanted to know ($N2_E$) what the script was, so that they could prepare themselves. In the beginning, there was mutual trust (T) on the basis of past performance and reputation, and the ensembles were also willing to share their vision, despite the fact that the ensemble members were unpleasantly surprised that a RWA executive was present.

During the meeting, the participants asked questions whether ensembles considered certain aspects in their vision. These questions helped to understand the shared information (*cognition*). From the aftermath, we saw that ensembles incorporated elements of the visions of the other ensembles in their own, suggesting the uptake of this type of knowledge to the level of *adoption.*

At the call of the chairman to further improve the vision (K2), the researcher diagnosed a psychological barrier. The participants reacted defensively to the request of the chairman, but the chairman was insufficiently aware of this and kept repeating his approach, which worked like a red rag on a bull. The RWA executive's argument exacerbated the participants' emotions because he was unable to speak their language, suggesting a *transmission* barrier. The participants thought that they had to design the dike in more detail for the PT, whereas the chairman meant that the ensembles should write/ present their current vision to other layman's people. After making this real time diagnosis, the researcher suggested to the SBG chairman to make an intervention. The intervention was aimed at telling that the presented vision should be adjusted for other target groups. With this intervention, the emotions fell back to a normal level and people were reassured. In the next ELs meetings, the required steps to prepare the ensemble visions for the next audiences were discussed, suggesting the uptake of the shared K2 to the level of *reference*.

Thread IV: ELs meetings to prepare for the board conference

The script for the board conference (I_{59}) was prepared in a series of three ELs meetings by the PT and ELs. Before and after these ELs meetings the researcher had bilateral meetings with the context managers to address potential barriers and failure mechanisms. During these ELs meetings, the researcher was able to diagnose barriers, but also foresee potential barriers in the next meetings. Based on the non-verbal and para-verbal behaviour of the participants, the researcher was able to timely intervene to ensure the preconditions and mitigate potential barriers.

Context: After the external meeting, the PT and ELs prepare for the board conference (I_{59}) at the end of April 2017. This meeting is prepared in a series of three ELs meetings (I_{52}, I_{53}, I_{58}). The ELs and context managers first reflect on the external meeting, with the aim of learning from it. In preparation for this specific EL meeting (I_{52}), the context managers made a script for the board conference. Prior to the consultation, the researcher made a hypothesis, based on the FODIKI framework, and proposed suggestions on how to deal with the differences between the five ensembles, partly prompted by the historical differences between the villages and therefore differences in the cultural core values. The researcher's advice focused on paying sufficient attention to their possible nervousness by helping them to speak the language of the administrator. In this thread, we briefly outline the first two meetings of ensemble leaders (I_{52}, I_{53}), aimed at preparing for the board conference.

Observations (I_{52}): The EL of Haaften says that during the external meeting (I_{49}) he had spoken with someone from the Directorate-General for Public Works and Water Management, who had introduced himself as the 'man of the money' and been enthusiastic about Haaften's plan. The EL happily reports this conversation, and says that he is convinced that their ideas will be realised.

Intervention: At this moment, the researcher diagnoses that the role and position of this person has been misinterpreted, raising expectations in this ensemble that cannot be met. The researcher signals the context manager through eye contact that intervention is needed to temper the expectations.

The context manager responds to the EL by explaining the position of this person. 'He works for the DFPP Programme Board and attended the meeting to get a feel for the project. He is well informed, but does not represent Rijkswaterstaat, and he did not consider the impact of his words'. The context manager indicates that he would regret if the Haaften ensemble was put on the wrong feet by this DFPP representative. Then they start discussing the structure of the board conference. The context managers tell that in their experience administrators will ask different questions than the residents during the community consultations, and that the view of an executive is likewise different from an administrator. 'We want to prevent the executives from not considering the proposals. This means that we must make concrete proposals, and make clear that we do not ask for a 'yes' or 'no' to the idea, but that we want them to consider its feasibility. We want to tackle recognisable themes, which is why we propose to group the ensemble proposals into about five themes'. An EL rephrases this by saying that the idea is to make the executives curious. The context managers propose to keep the contributions of the ELs limited such that the executives have more time to discuss the proposals. The context manager suggests making a video presentation for each theme, as the ELs can then focus on the discussion. The idea is that each EL would present one overarching theme which includes ensemble proposals from all ensembles. Two ELs react enthusiastically to this plan. They indicate that they are glad that they do not have to give a live presentation. One context manager tells that he has already regrouped all ensemble proposals in different themes to structure them for the executives.

Intervention: At this moment, the researcher diagnoses that the ELs may think that it is no longer possible to make additions to the list of all the ideas that have been developed. This might lead to lower trust in the PT. To ensure that support remains for the next steps towards the board conference, the researcher proposes to send the list with the developed ideas to the ensembles, inviting them to make whatever changes they see fit. The next step will then be to organize this list according to the chosen themes, which is probably on the agenda for the next time.

The participants react positively to this process proposal and agree to comment on the list. The chairman then closes the meeting.

Interpretation, diagnosis & interventions: In this meeting, the context manager (as sender) shared the script for the board conference drawn up by the PT. The need (N) of the ELs is to know what the ensembles should prepare and develop for the board conference. The preconditions for knowledge transfer and uptake were satisfied, as in recent months, a great deal of interpersonal trust (T) had been built up and they had worked together towards the board conference to gain support at executive level. The ELs were willing to share their knowledge and experiences around the ensembles.

The Haaften ensemble's expectations of Rijkswaterstaat can be seen as an *incorrect use* failure mechanism, as the knowledge transferred by the administrator of Rijkswaterstaat was interpreted differently than intended. The context manager (as third party) tried to reject the knowledge of the RWS administrator (as sender during the external meeting) by indicating that this person was not in a position to say that the plans will be realised, which eventually dissuades the EL from taking up K of the DFPP representative (*diffidence* failure mechanism). In this way, the context manager tried to keep the trust of the ensemble and the expectations for the future realistic.

Around the design of the board conference, a *psychological* barrier threatened to arise because the ELs seemed to get the feeling that they were unable to influence the ensemble proposals and themes for the board conference. The researcher's intervention to let them review, and even add additional ensemble proposals to the list, aimed to restore trust and obtain support for the chosen approach. The context managers themselves also made interventions to include the ELs in the script for the board conference. For example, the advance recording of the presentations was proposed in part because of the big difference in presentation skills, and also because of the desire to have sufficient time for discussion among the executives. The uptake of the script for the board conference reached the level of adoption, as the ELs changed their actions.

Intermezzo: Prior to ELs meeting (I_{53}), the context managers and the researcher discussed about the desired outcome of the meeting and about the way in which the context managers wanted to take the ELs along. The researcher made several suggestions to ensure that the chosen approach would match the knowledge requirements of the ensembles, the realisation (of elements) of their vision, and the ELs' personal competencies. She also advised which wording would best match the executives' language. In the meantime, the ensembles discussed the script within their ensemble and added additional proposals to the long list, while the PT found a video maker to record the main message for the different themes. Two weeks later the ELs meeting (I_{53}) takes place.

Observations: The context manager introduces the video maker who shows some of his recent work, and explains what he needs to make a good video. The ELs are impressed by the quality and look forward to the recordings and the results. However, several ELs also indicate that they find it difficult to present the proposals from the other ensembles. An EL adds that he has trouble 'handing over' the ideas. The context managers try to convince the ELs that the executives cannot handle all the ensemble proposals (by now more than 100), and that they hence need overarching themes. A context manager emphasizes the need to focus on the top 5 proposals from each ensemble. After all, the aim of the board conference is that the executives will embrace several ensemble proposals. An EL supports this plea by indicating that the main issues must be separated from side issues. The context manager proposes to mention five ideas for each theme, but he needs to explain this several times to persuade the ELs. The ensemble Haaften requests extra attention for their ideas. A context manager responds that his concerns are that the ideas and themes will not be absorbed by the executives, and that then the work of the ensembles will have been for nothing. He advocates a form of rethinking. During the meeting, everyone lists the most important themes and desired milestones from their own ensemble vision. A context manager then suggests that the PT will elaborate the themes further. The ELs agree, and they divide the themes among themselves. A discussion about the activities of the past year by the ensembles arises.

Intervention: At this moment, the researcher diagnoses that the ensembles already know the role and position of the ensembles, but that the executives still have no idea. She remembers that during the external meeting, an EL had given a presentation that was much appreciated by the participants. The researcher tells about this presentation and proposes including a similar introduction also in the script for the board conference.

The context manager reacts enthusiastically and the EL in question concurs. This proposal is then included in the process design. Finally, the context managers ask what the ELs need to make the videos a success. Everyone indicates the importance of a coherent story. For this, they say, it is necessary to have the message written out, so that the ideas of the different ensembles are sufficiently covered. The ELs point out that they are looking for ways to write down the message for each theme.

Intervention: At this moment the researcher makes the diagnosis that the ELs lack knowledge to understand the proposed script for the video recording. She observes questioning eyes of the ELs, and therefore the researcher proposes to make a so-called two-stage rocket: the context managers draw up an initial concept of the storyline for each theme, including the ensemble proposals, and send this to the ELs. The ELs can collect comments from their ensemble, and give their reaction to the context managers, who make the final version.

The participants react enthusiastically to this suggestion, which is adopted in the planned sequence of steps that is discussed during the meeting. Several ELs reflect during the meeting that they ppreciate the two-stage rocket, and that they feel comfortable with it. After this, the agenda of the meeting is followed further.

Aftermath: The third ELs Meeting (I_{59}) is organized as a joint meeting with the SBG. The idea is that the SBG members can formulate and advice based on the videos for the SBG chairman, so that he can bring this over the footlight during the board conference. During the combined meeting, however, it becomes clear that some SBG members lack knowledge, which leads to misunderstandings during the meeting. Some SBG members ask clarifying questions why certain proposals are highlighted and why these themes were chosen. They say that they expected different themes, and that some ideas are missing, and suggest some changes to the in the video mentioned ensemble proposals. The CM concludes that the SBG members have been involved only marginally in the entire process towards the board conference, and hence require additional knowledge. Despite some differences, everyone is satisfied with the videos that were made of the themes. They jointly suggest a few refinements to the underlying proposals.

Interpretation, diagnosis & interventions: In this meeting, the context manager (as S) further elaborates on the process design for the board conference (K). The ELs (as R) wanted to know what and how they should prepare for the board conference (N). Trust was high, so similar to the previous meeting, the preconditions for knowledge transfer and uptake were satisfied.

One context manager diagnosed potential barriers during the meeting. For example, he proposed that the PT could write out the storyline for each theme, when the ELs indicated (fb) that this was difficult for them. He also indicated that the ensemble proposals should be grouped into five themes, as this categorisation would help the executives to adopt them. In this way, he tried to mitigate a cognitive barrier during the board conference. After more in-depth explanation about the necessity of the grouping, all ELs support his view.

In addition, the researcher made two real time interventions by transferring knowledge from the previous meetings to ensure that the ensembles continue to recognise

themselves in the approach, and that the ideas and contributions from each ensemble still remain visible. During the meeting, the researcher repeatedly saw the concerns of the ELs in their non-verbal and para-verbal behaviour. She intervened by addressing these concerns, in order maintain the precondition *willingness to share* among the ensembles. The uptake of knowledge reached the level of *reference*, as participants referred to the shared knowledge within the meeting.

In the aftermath, we described the joint meeting of the SBG and ELs (I_{59}), which showed that *transmission* and *cognitive* barriers occurred, as the SBG members were not involved in the trajectory to the board conference, and some SBG members reasoned from a different frame of reference. The participants also had different ways of working, suggesting the occurrence of *psychological* barriers. These barriers could be prevented by considering the differences in knowledge base in the preparation and adapting the process accordingly, and requesting feedback during the meeting. In this specific meeting, the uptake reached the level of *effort*, as the SBG chairman formulated the SBG advice for the board conference.

This thread also shows that barriers can still occur. We also observed this in a bilateral consultation between CMs and the researcher (I_{96}) a walk-in meeting (I_{98}), and an AMG (I_{100}), where *cognitive* and *psychological* barriers after 12 months of cooperation. The process manager should always bear the FODIKI concepts in mind while designing an interaction moment, and regularly ask feedback during a meeting to check whether everyone has a similar understanding of the used terminology. As new participants enter during meetings, they often have a knowledge deficit, which means that barriers can arise quickly.

Thread V: Crash course dike reinforcement

In this thread, the researcher proposed a quasi-experiment by involving a novel way of transferring knowledge from the PT towards the ensemble members. The PT agreed with her script, and the researcher discussed and prepared the script with the experts who would offer the crash course.

Context: The ensemble members had many questions about how a dike can be reinforced. During previous meetings, the technical manager had already transferred knowledge about dike failure mechanisms. The ensembles indicated that they nevertheless lacked knowledge about the design process and the possible technical solutions. After the start of the participation process with the ensembles, the project team had organised an excursion to a nearby dike reinforcement project, and invited two landscape architects to sketch the integration of the dike into its surroundings. The technical manager had also visited the ensembles to discuss the technical (im)possibilities with them. During these meetings, questions remained about the technical aspects of how a dike is reinforced. Therefore, the context managers proposed to organise a crash course in dike reinforcement (I_{27}).

For the crash course, the context managers had drawn up a script to organise two rounds in which the participants could choose from three subjects, namely: (1) technique of the dike, (2) significance of floodplains for the dike reconstruction, and (3) decision-

making and the role of the interested parties. In a trilateral meeting (I_{24}), the two context managers and the researcher discussed this structure. The researcher suggested to bring more focus in the script, as the primary goal of this meeting was to send knowledge from the RWA towards ensemble members. The researcher emphasized that the presenters should tailor their presentation to the needs of the ensembles.

The researcher also proposed to measure the knowledge level before and after a presentation, by quizzing participants on a set of propositions. This intervention is a 'kind of pretest-posttest design' (Campbell & Stanley, 2015). If the participants answer more propositions correctly after the presentation, we can conclude that the knowledge uptake might be responsible for the improvement. The CMs chose this approach for two topics, namely technique of the dike and the significance of the floodplains for the dike. After the consent of the context managers, the researcher had preparatory meetings (I_{26}) with the presenters of these topics. They jointly formulated the propositions. Participants had two colour cards at their disposal, blue and yellow: 'Blue', if they thought the proposition was correct; 'Yellow', if they thought the proposition was wrong. The researcher also impressed onto the presenters that they should use terms that fit the residents' language. Please note that during the crash course, the researcher was able to attend only one session per round.

Observations: The crash course starts with a plenary kick off by a context manager. He explains the script for the evening and says that the participants can choose two out of three session: (1) 'dike technology, given by the Technical Manager, (2) floodplains, given by a very experienced colleague of the RWA, and (3), stakeholder management, given by the CMs to give more insight in who is involved throughout this project'. The participants then split into three groups for the first round. In the floodplains group, the presenter first quizzes the residents on the propositions, explaining that this is at the request of the researcher. Most participants respond incorrectly the propositions, after which the presenter explains the correct response. After this, he starts his actual story, in which he explains the influence of interventions in the flood plains. In between, the ensemble members ask various questions about specific locations along the dike. The presenter cannot answer all questions because he is unfamiliar with the local situation. He discusses recently developed innovations, such as trees that can reduce waves on the dike. He also tells that on a national level, Rijkswaterstaat conducts research whether the crest height can be lower because of the presence of bushes in the floodplains. He says that the bushes must remain there in times of high water, and that proper agreements must be made with the manager of the bushes, since they are not owned by the RWA. He explains that every 12 years the RWA assesses the dikes to check whether they fulfil the statutory requirements, and that therefore the RWA wants to own the land in the near vicinity of the dikes, for example near the '*Peilschaalhuisje*' of Herwijnen. Another innovation example is the construction of '*grienden*' for a new dike. The participants ask questions about Natura 2000 areas and the possibility of strengthening the dike there. The presenter does not know enough about the rules for Natura 2000 to answer this question; he does indicate that the trees have been there for a long time at that specific location, and the question is how strong these trees still are. The participants ask questions about the influence of tree roots on the dike failure mechanism piping, which leads to a discussion about whether the trees should be felled. The ensemble members appear confused by the concept of 'grienden' and where they may or may not be used.

The presenter tries to explain this concept in more detail. After this, the presenter again quizzes the residents on propositions, and now almost every one responds correctly.

In the second round, most people in this group go to the presentation about dike technology. Here, the presenter also starts with five propositions, which most residents responds correctly, and then tells more about the different techniques, how a dike can fail, and what possible ways there are to strengthen the dike. He discusses the four main dike failure mechanisms: height of the dike, piping, inward and outward macro stability. For each failure mechanism, he explains how the dike can be reinforced, adding soil inwards or outwards or with a construction, and that for each solution variations are possible.

A resident asks if there are new insights, and whether Delft University of Technology also has new insights that can really work. The presenter reacts that he will come back to this later in the presentation, because technology keeps on developing. He explains what the possibilities are when houses are located in the inner slope of the dike; one option is to move the dike towards the river. A resident remarks that the presenter had just explained that this is not always possible when houses are in the flood plains. The presenter agrees, and says that there are other solutions, e.g. innovations such as dike nailing techniques, and drainage techniques to prevent piping. The residents ask why you would design the dike for 50 years, especially as the previous dike reinforcement was only 20 years ago. The presenter explains that currently different ways to strengthen the dike are being looked at, but when we look at climate change, we don't know where it will end. The residents also ask about the balance between dike reinforcement and room for the river measures. The presenter tries to explain that dike reinforcement is needed in combination with creating room for the river. In the case of the failure mechanism piping, he also mentions innovative techniques, such as vertical sand dense geotextile, and the course sand barrier the RWA is currently investigating, and he indicates the advantages of these techniques compared to conventional techniques. At the end of the session, he shows the five concluding propositions, to which almost all residents respond correctly.

The context manager closes the evening by stating that the PT, and thus the RWA intends, to involve the residents in the dike re-design process. For this, he says, the ensembles can use the technical jargon, and invites everyone to contact him if they have any additional questions. He shows a booklet that contains tonight's information and gives an overview of all the building blocks and the decision-making procedures and the measures one can take in the floodplains. Finally, the context manager emphasises that he sees his role as a liaison officer between the residents and the dike designers to do it together.

Aftermath: In the internal meeting, and subsequent meetings, the ensembles show that they have considered specific techniques at specific locations in their area. The innovative measures to counter piping are specifically mentioned by the ensembles of Herwijnen and Vuren. The ensembles also use the dike failure mechanisms correctly, in such a way that during an EMG (I_{38}) the RWA executive tells the other EMG members that the residents know almost more about the dike than he does himself.

Interpretation, diagnosis & interventions: In the crash course, the RWA acted as sender and the ensemble members as receiver, where their need (N) focussed on the different

ways in which a dike can be reinforced, and which technique might be suitable for a specific location. The preconditions for knowledge transfer and uptake were present, as the RWA trusted the residents, that they would not intentionally harm the RWA when given the opportunity to do so (benevolence-based trust), and the residents trusted the RWA that they would share their knowledge about a given subject area (competence-based trust).

During the presentations, clarifying questions were asked by the participants suggesting the occurrence of *cognitive* barriers. However, the participants also asked location-specific questions to generate ideas for their own ensemble, and they gave feedback (fb) to the sender by asking clarifying questions. The sender was then able to explain the concepts further, preventing cognitive barriers. Throughout the evening, we did not diagnose any other barriers.

The propositions before and after served as an intermezzo. We observed that in round 1 the propositions were answered better afterwards, from which can be concluded that the transfer of knowledge was successful. We saw a learning effect between round 1 and round 2, as the knowledge gained in round 1 already gave participants a head start at the beginning of round 2, suggesting the uptake of the shared knowledge. The questionnaires handed out after the crash course (with a response rate of 90%) showed that each ensemble was equally represented, that the participants were satisfied with the script of the evening, and that the three presentations were found clear and unambiguous. Three participants reacted afterwards in the questionnaire that the propositions seemed childish and had no added value. The fact that the knowledge transferred was later correctly applied within the ideas of the ensembles suggests uptake to the level of *adoption*.

5.3 Cascading effects

In this section we describe several threads, where cascading effects occur in and between meetings.

Thread VI: Development of visualizations as discussed during the ELs meetings

In this thread, cascading effects become visible. The researcher intervened on two levels, by trying (a) to make the context managers aware of the consequential damage when barriers persist, and (b) to give the participants insights and tooling that they can help to shape the script for the internal meetings.

Context: In the regular ELs meetings the ELs shared perceptions with each other about the progress of the ensembles. After the summer break, the PT and ELs agreed that two landscape architects would support the ensembles with the representation of their vision, by means of a map in which all ideas are drawn, and several 3D visualizations. We will refer to this agreement as the 'assignment'. The landscape architects would ensure that the maps they would draw would all have similar layouts. The first maps should be ready before the internal meeting (I_{29}). In meetings between the ELs (I_{28}, I_{33}) and an internal ensemble meeting (I_{32}) the progress of the map and 3D visualizations were discussed. During these meetings, the researcher intervened in real time as well as afterwards.

Observations: Shortly after the start of the ELs meeting (I_{28}), some ELs express their dissatisfaction because the two landscape architects are difficult to reach, and that it is difficult to make an agreement with them. They are, however, enthusiastic about the maps and 3D visualizations. One ensemble indicates that their first step is to make the map, and that only then they want the 3D visualizations to be made. The EL reports that the landscape architect has said that he only wants to make one 3D visualization. Another EL explains that they discussed various possibilities for creating 3D visualizations. The ELs have a lively conversation about these 3D visualizations and what the landscape architects should deliver. A context manager explains that they act merely as the commissioner, leaving it entirely to the ensembles and landscape architects to define the end product. The ELs indicate that they find it difficult to define the end products together with the two landscape architects, as the landscape architects give contradictory answers. A context manager promises that he will contact both landscape architects to solve all ambiguities. He emphasizes that in the period up to the internal meeting little time is available to have a fully elaborated map and one or more 3D visualizations. He expects that these will be completed in the weeks after the internal meeting.

In the remainder of the meeting, they talk about the structure of the internal meeting (I_{29}). The ELs see a variety of interests in their ensembles, and not everyone from the villages is participating. To gain more support for the ensemble ideas, one EL proposes to organise a community consultation meeting in which he would like the RWA to give a brief explanation of the dike reinforcement project, followed by a presentation of the ideas of his ensemble. He asks whether the RWA is willing to facilitate this. Another EL endorses this idea. One EL reacts that residents only reason from their own interests, and he questions whether this script will work in his community. The context managers say that they are willing to support the ensembles in these community consultation meetings, on the condition that all of the ensembles will hold such a consultation. They will later prepare for these community consultation meetings, and promise to pay specific attention to the script for the ensemble having concerns about its feasibility.

After this, the script of the internal meeting is further discussed. The context manager proposes that each ensemble tells its story in twenty minutes, with the RWA taking care of the location, beamer and poster boards. An EL indicates that he wants more time for their presentation because he has already done a trial presentation and he needs at least thirty minutes to tell the story. He suggests that a larger ensemble needs more time than a smaller ensemble. A lively discussion about the script arises, but no consensus is reached.

Intervention: At this moment the researcher diagnoses that the parties are designing an interaction moment without having a clear picture which knowledge is to be transferred to whom, and what the desired uptake is. That is why the researcher intervenes by asking what the participants want to achieve in those twenty minutes: do they just want to bring information, or do they also want to collect ideas? And when would the ensembles themselves be satisfied after this meeting?

One EL indicates that they would like to get new ideas and then incorporate them in their own presentation. This leads to a discussion about a uniform script for the five presentations.

Intervention: At this moment the researcher diagnoses that the participants have no expertise on how to organise this type of meeting. The researcher improvises a knowledge transfer moment on the spot about how this meeting can be organised and suggests that each ensemble, for example, has ten minutes to present, after which there is ten minutes to react or have a conversation.

A context manager concurs, saying that if every ensemble would present for half an hour, the meeting would take until midnight. Other ELs react that ten minutes is quite short to tell the story and say that it also depends on the material of the landscape architects. The context managers say that a 10-minute presentation leaves sufficient time for potential questions. 'As facilitator of the evening, we will ensure that each ensemble can talk at least 10 minutes about their ideas'. The ELs still have reservations about this meeting design.

Intervention: At this moment the researcher diagnoses that there is cognition and even reference of the script, but that the participants are not integrating the proposed script into the programme. Therefore, the researcher intervenes and writes on a flipchart the purpose of the internal meeting and the already proposed script for that meeting. When writing down the goal – sharing the main lines of the ensemble ideas – she asks confirmation from the ELs that this is the goal.

By seeing it laid out on paper, the participants become convinced of the idea and think further about the necessary conditions to reach this goal. The participants indicate that they do not want anyone to undermine the presented ensemble ideas during the meeting. They want that the chairman of the internal meeting emphasizes this when explaining the rules of the evening. The context managers suggest that after the 10-minute presentation the audience can react. The reactions can then be collected on a map of the specific ensemble. Some ELs react enthusiastically by indicating that the names of the respondents can be noted down, so that the ensemble can ask for further explanation if necessary. Everyone agrees that the aim is to inspire the other ensembles, as they believe that certain ensemble ideas are also relevant to other parts of the dike. The ELs unanimously emphasize that the rules of the game must be well established and discussed. An EL indicates that he can imagine that at the internal meeting the forms of presentation will still differ, but that this must be levelled out before they are presented at the external meeting. They agree that this a point for attention in the next ELs meeting.

Aftermath: After the meeting, the researcher indicates to both CMs that it is important to ask the landscape architects to have a good and transparent communication with the ensembles, because this could have an impact on the participation process. The researcher says that this might otherwise lead to a loss of trust of the ensembles in the PT, possibly resulting in far-reaching consequences for the result of the participation process.

Interpretation, diagnosis and intervention: The context managers were the sender, while sharing the assignment of the landscape architects and the script for the internal meeting (K). The ELs (as R) were keen to learn what they could expect from the landscape architects and how they, as ensembles, could prepare for the internal meeting. Throughout the meeting, the participants were willing to share knowledge, and they trusted (T) each other on the basis of their public office (CMs), their open and constructive attitude (ELs), and as they had worked closely together in the past period.

The researcher made two real time interventions during the meeting. The first intervention was to make them realise that they are designing for a next meeting. A *cognitive* barrier occurred because the ELs lacked this awareness, and the CMs were unable to agree with the ELs on a particular script. The intervention of the researcher was aimed at offering knowledge ('stepping stones') to the participants so that they could talk further about the script. The second intervention was when the participants thought that they could not prepare a meeting, and the researcher explained how during the internal meetings information can be shared. This intervention was aimed at reaching consensus about the scope and goal of the meeting. In the feedback from the ELs, we diagnosed that the ELs were afraid for the possible disqualification of knowledge by the guests during the internal meeting. That is why the chairman of the ELs meeting suggested to draw up rules for the internal meeting. In FODIKI terms, they anticipated the *diffidence* failure mechanism after the internal meeting, and wanted to prevent this from occurring. The uptake of knowledge ultimately reached to adoption, since the script was supported by everyone and everyone took their own role. During the internal meeting (cf. thread III), we observed that the ensembles kept to the available time, suggesting the uptake of the researcher's intervention until the level of *adoption*.

Also, the uptake around the expectations of the landscape architects was successful. The ELs (R) wanted to know (N) exactly what they could expect from the landscape architects. The context managers (S) explained the 'assignment', after which the ELs gave feedback that the CM should explain the assignment again to the landscape architects, after which CM2 agrees to take this action. The uptake reached the level of *reference*, as during the meeting the ELs referred to the assignment. Nevertheless, the researcher received para-verbal signals that the ELs still had doubts about whether both landscape architects would be open and transparent in their approach.

Intermezzo: Between this ELs meeting (I_{28}) and the next ELs meeting (I_{33}), an ensemble meeting (I_{32}) took place. Although this meeting is not interesting as a knowledge interaction moment *per se*, it helped to understand the course of the next ELs meeting better. The ensemble members discussed that the landscape architect had not or only partially processed their input. A lively discussion arose as to whether the ensemble should supervise the landscape architect. A member indicated that he believed that the ensemble should ask themselves these two questions: (1) does the current map accurately reflect the ideas of the ensemble, and (2) what kind of visualization can we develop to make our ideas even more appealing to our fellow residents. In the remainder of the meeting the participants discuss the necessary improvements to the map.

A week after the ensemble meeting, the next ELs meeting (I_{33}) takes place where again the work of the landscape architects is discussed.

Observations: One EL tells that he has tried to call the landscape architect several times, but failed to reach him. The landscape architect did not call back, even though the EL has sent the desired changes for the map via e-mail. Another EL suggests sending WhatsApp messages, as in his case, the landscape architect reacts quickly to this. Another EL says that the landscape architect said that he can only make one 3D visualization, because his budget is almost exhausted. The EL of the ensemble meeting I_{32} indicates that there are several perceptions within his ensemble, also about who actually tells the landscape

architect what to do. One EL indicates that he has requested four 3D visualizations. He tells that he first sketches the images himself and that the landscape architect can then take over to save costs. He says he expects that 'the support from the RWA will be generous'. The context manager indicates that he will contact both landscape architects again, but his attitude reflects little enthusiasm. The ELs continue to ask attention for this.

Intervention: At this moment the researcher diagnoses that the commitment of the context manager does not suffice to maintain the trust of the ensemble leaders. The researcher believes that the context manager should be transparent about the expectations of the landscape architects, and she seeks eye contact with the other context manager.

This context manager understands the non-verbal message and promises to contact the landscape architects to have clear mutual expectations and that the made agreements will be sent by email to the ELs.

Aftermath: After the meeting, the researcher shares her diagnosis with the CMs and adds that she observed that the concerns of the ELs persisted after the previous meeting (I_{28}), and that the trust of the ELs in the context managers even seemed to have decreased, considering the words used by the ELs, their intonation, and their non-verbal behaviour. She proposes that, as agreed in meeting I_{33}, the context manager quickly contacts the landscape architects, and afterwards clearly communicates the agreements with the ELs. 'Otherwise', the researcher says, 'this might have large consequential damages, despite all the effort undertaken to have an open and transparent stakeholder engagement process'.

Interpretation, diagnosis and interventions (I_{33}): Again, the CMs (as S) shared the assignment of the landscape architects and the script of the internal meeting (K). The ELs (as R) gave feedback on their interactions with the landscape architects, and were keen to learn what they could expect from them, because the problems with the landscape architects persisted. The trust of the ELs in the context managers seemed to have declined slightly on this subject, but the preconditions for knowledge transfer and uptake still appeared to be satisfied.

During the consultation (I_{32}) of one ensemble, the *incorrect use* failure mechanism seemed to have occurred, as the knowledge sent by the ensemble was interpreted differently by the landscape architect. That the ensembles found it difficult to supervise the landscape architects and felt that they were not fit for this task, suggests a *psychological* barrier. The *cognitive* barrier occurred when a context manager did not respond adequately to the ELs' desire to make further agreements with both landscape architects. The ELs felt that their comments were not recognized by the context manager. Through eye-contact, the researcher communicated with the other context manager that an intervention was needed, which she further explained after the meeting. The problems around the landscape architects persisted and the ensembles only referred to the assignment, suggesting that, in comparison with the previous ELs meeting, where the uptake reached the level of *reference*, the uptake of this knowledge did not go to the next level.

Thread VII: Community consultation meetings to present ensemble ideas

In this thread we describe the iterative process of preparing and conducting five consecutive community consultations ($I_{39\text{-}42,\ 45}$) in terms of observations, diagnoses and proposed interventions. Based on the first community consultation, the researcher developed an observation scheme with expected barriers and failure mechanisms. She updated this every time, after she gave advice and suggested changes to the script and presentations.

Context: Before the ideas of the ensembles were presented to the representatives of regional governments, interest groups and companies, the ensembles first wanted to hear the reaction from their own village community. Therefore, they asked the RWA in I_{28} (cf. thread VI) to organise community consultation meetings. Differences between the ensembles were noticeable, as two ELs were enthusiastic about the idea from the start, whereas another EL had doubts about this idea, because his members feared negative reactions from the community. In earlier participation processes in this community, he said, threats were made to the former leaders. For this reason, the ensemble wanted the script to be tailored to their community. The script was essentially the same for every community consultation: the PT started with a short presentation about the necessity of the dike reinforcement, followed by the ensemble presenting their vision on the dike. After this plenary part, the participants could draw on the maps to show which ideas they embraced and/or they wanted to amend, and of course, the residents could also indicate that they have good reasons for rejecting certain ideas. All the community consultation meetings were held in the evening. The invitation letter that was sent to all residents stated the following:

> 'Under the motto 'Our dike: safe and liveable', working groups of residents have made a vision on the upcoming dike reconstruction and its surroundings for specific dike stretches. This vision was drawn up at the request of the RWA. The members of the working group and the RWA would like to know what the other residents think of the developed vision: Is there anything missing, what can be improved, what should *not* be included? That is why the RWA has planned five meetings on behalf of the ensemble working groups. For each location, one ensemble working group will present their ideas and plans for that specific area'.

The researcher handed out a questionnaire directly after each community consultation meeting, to collect more information about the way the participants perceived these meetings. The researcher used the results of the questionnaire to propose interventions to the PT.

1. Community consultation meeting Vuren

Context: The first community consultation meeting (I_{39}) took place in the evening at the village hall of Vuren, and 57 residents were attending.

Observations: The PM starts explaining the necessity and approach of the dike reinforcement. On the subject of necessity, he explains that the previous dike reinforcement was constructed with the idea that it would suffice for the next 50 years. The dike was then reinforced with the standards and knowledge of the past. What could

not be foreseen is that the Delta Programme would lead to new statutory standards. The choice was made to provide a basic safety level throughout the Netherlands. The PM uses a map to show that the area with the Dutch major rivers is coloured red and mentions that this area is 'underinsured'. The PM shows various scenarios, based on calculation models, to show that the bathtub edge (the dikes) must be raised, because we will deal with higher river discharges in the future, whereby new insights regarding the strength of the dikes will require wider dikes. The new standards have been in force since early 2017. Partly because of these standards, he explains, the full 23 km failed to pass the statutory assessment. He explains the dike failure mechanisms step by step in reasonably technical terms. The reactions of the participants focus on 'whether or not we are exaggerating for the future', and another reaction: 'There is a lack of common sense as calculations only are unable to reveal whether the dike is really in a poor condition. People expect....' The PM repeats that the calculation models do show this, but this argument does not seem to convince the participants. The chairman repeats the PM's statement that the river area is underinsured and that when a flood occurs, many people will be killed and that the economic damage will be large. The participants confirm (nodding) that they do not want this. The PM then shows the possible solutions and the innovations that the RWA is working on. He outlines the time schedule for the ensembles in the past year. He compliments the Vuren ensemble on the work they have done, the high quality of the delivered work, and he says that he is curious, as he has not seen the result. Finally, he gives a future perspective for the period up to 2023, where he emphasizes that the PT, the ensembles and residents will sit down at the design table to realize the future dike design. In those stages, he says, it will become clear whether and how the RWA incorporates the ensemble ideas in the dike redesign.

Two ensemble members present their vision for the specific trajectory Fort Vuren - Brakelseveer. They emphasize that the ideas shown are potential solution paths, not the solutions. They inform the participants that they want to present their vision and plan to the residents living in and near Vuren, before they are shown to third parties to gain support, but also to collect ideas and to enable everyone to participate in their vision. They start with the similarities of the ensembles through the slogan "Our dike: safe and liveable". They tell that five ensembles made proposals for the dike redesign, such as stimulating constructive measures or taking a certain vision into account, whereby the 'pustules of ugliness' will be eliminated. This refers to companies that may consider relocating their activities in the next 50 years. The question is whether the dike can be designed such that the plans of the residents remain feasible. They sketch the possibilities with a map and impressions of the current and proposed situation. In between, the residents already ask various questions about the ideas, especially about the preservation and/or increase of nature development, the preservation of homes, and the possible relocation of industrial sites. The ensemble members also emphasize the cultural-historical value of the houses on the dike, as this is currently only visible near the old church of Vuren. The ensemble members indicate that they have investigated various possibilities for the dike stretch, and that tonight they present what they see as the most feasible. The chairman invites the participants to answer the following questions: (1) What makes you enthusiastic? (2) What additions do you have to the plan?, and (3) What proposals should we not consider? The residents give immediately reaction to the first two questions, and they express their concerns about the available financial resources, the impact on their own houses, and the relocation of

the mentioned companies. The ensemble draws the conclusion from the reactions that the community supports the plan. At the end of the evening, the necessity for the dike reinforcement is again focus of attention. The residents indicate that they do not believe that river discharges are rising. 'After all,' as the residents say, 'since 1995 we never had high river discharges again'.

Aftermath: After the meeting, the researcher proposed to the PM and CMs to emphasize, when presenting the necessity of the dike reconstruction, that the central government had set the new statutory standards, because they wanted everyone to have the same safety level. She also suggested to emphasize that the new insights into the strength of the flood defences and the new standards meant that this was a major challenge in the river area. She points out that the PM often spoke of 'we', which suggested that the RWA had formulated these standards, whereas in fact they adopt national policy. The PM and CMs all agree with this diagnosis and proposed interventions for the next community consultation. After seeing the maps made by the landscape architects for the ensembles, the researcher also proposed to change the logos on the maps of the ensemble proposals. The maps now showed the logos of the RWA and the landscape architects' bureau. The researcher suggested that the various ensembles should be added there, for example Ensemble Vuren by [logo consultancy]. This would strengthen the idea that the solution paths were generated by the ensembles, and thus who owned the ideas. The context managers support this suggestion, because, as they indicate, they are worried about the expectations of the involved stakeholders.

Interpretation, diagnosis, and interventions: At first, the ensemble acted as sender (S1) and the residents as receiver (R1). The residents' need (N1) was to know more about the necessity of the dike reinforcement and the ideas of their fellow residents. The roles reversed whenever the residents (S2) responded to the ensemble (R2). The ensemble's need (N2) was to know which elements of their vision were supported and in which areas they can enrich the vision. The other preconditions for knowledge transfer and uptake also appeared to be met, because knowledge was shared, and the participants gave their comments on the vision. In this meeting, we distinguished between the trust in the project team/RWA and trust in the ensemble. The questionnaire showed that 75% of the participants supported the plans of the ensemble. Most participants also trusted the ensemble, and some participants even called one of the ensemble members the 'informal mayor'. The resident's trust in the RWA was considerably lower than their trust in the ensemble, as shown in their non-verbal and paraverbal behaviour.

During the presentation about the necessity of the dike reconstruction, both *transmission* barriers and *cognitive* barriers occurred, mainly because the terms used by the PM were often too technical. In addition, we saw that the knowledge shared with the residents did not fit with their belief that river discharges would be much higher; hence we consider their argument that since 1995 the water had not been so high up against the dike, to be an indication of a *psychological* barrier.

Directly after the meeting, the researcher shared her diagnosis and proposed several interventions for the subsequent community consultation meetings, to mitigate potential *psychological* barriers, and potential failure mechanisms, related to the disqualification of the shared knowledge. She proposed to emphasize the choice of national government

to prevent flooding in the future, meaning that the current dike strengthening projects need to work with potential climate scenarios, and to stress that the areas along the major rivers have been underinsured in the last decades. Similar what happened during the 'walk-in' meetings in paragraph 5.1, the researcher still observed a mismatch between the sender's message and receiver's need. The sender in this case were the same, but only the receivers differed. The uptake of the early suggested intervention only partially succeeded. Yet, we did see a learning effect between the presentation during the 'walk-in' meetings and this first community consultation meeting. In addition, the researcher proposed ex-post meeting intervention aimed at adapting the receiver's need, and indicated that the PM should reuse the metaphor of the polder as a bathtub, as it appealed directly to the imagination of participants, especially when it came to potential damage.

The researcher aimed with her suggestion to change the used logos on the map that the shared knowledge would not be incorrectly interpreted and used by the receiver, for instance by the differences in assumptions or frames of references of the receivers. As currently the logo of the RWA was on the maps, the other involved stakeholders might believe that the PT and/or RWA developed the ensemble ideas, which could also suggest that the PT would do everything in their power to implement these ideas. The researcher's intervention was aimed to mitigate future barriers and failure mechanisms when the maps were used in other meetings. This type of intervention, aimed to mitigate the *cognitive* barrier, is also successful in other situations, as the researcher proposed similar interventions in I_{16} and I_{35} during trial presentations for the tendering process. In these interaction moments, the researcher suggested that the slides of the presentations should be clearly structured and that only the core of the message should be written down. In the first variant there was too much text. She also proposed to show pictures and a map of the project area, as that appeals more to the imagination than words.

2. Community consultation meeting Linielandschap

Context: Two days after the community consultation meeting in Vuren, the community consultation meeting at Gorinchem and Dalem (I_{40}) took place, in the same village hall in Vuren. The script was identical to the previous one. 37 residents attended the meeting.

Observations: After a short introduction, where the chairman did not introduce the ensemble members and project team members, the PM starts telling about the necessity of the dike reinforcement, taking to heart the suggestions made by the researcher. He talks about the dike failure mechanisms and the possible building blocks for the design of dikes. During his presentation, he receives a few questions from the participants regarding the scope of the project. The chairman then gives an ensemble member the stage, who says that he wants to prevent the dike from becoming a 'Soviet structure'. A he explains, 'one of the ideas is to make a retaining wall in such a way that the dike does not become a bombastic element'. The participants ask how much higher the dike should be. The PM reacts that uncertainties still prevail, but that the dike needs to be approximately 1 meter higher.

Intervention: At this moment the researcher diagnoses, that judging by their non-verbal and para-verbal behaviour, participants do not have a clear idea that the members of the

ensemble are co-residents, and that hence believe that the RWA has come up with the ideas. The researcher suggests to the chairman to clarify the role of the ensembles and explain that the residents were asked to develop a vision.

The chairman immediately takes a time-out to clarify the role and position of the ensembles. He explains that the ensembles themselves have defined building blocks and formulated the slogan 'Our dike: safe and liveable'. In a response, the participants ask is meant by the term 'building blocks', as both the project manager and the ensembles use this term, apparently in different meanings. The chairman explains both meanings, namely the project manager uses this term while describing how the design process is structured, whereas the ensembles uses this term to indicate what the overarching themes are between the five ensembles. Then one participant asks what process is followed by the ensemble working group. The chairman responds by outlining the past and future process around the ensemble working groups. He emphasizes that the RWA is only a facilitator in this process, but that the working group consists of residents, and that they are the initiator of this meeting. He outlines when and how people have become involved, and explains that the goal was to collect ideas and give them to the dike designers. The aim of this evening is to test and get comments and advice on the generated ideas in this community. The reactions that follow show that many people did not receive the invitation letter. The chairman explains that the letters were sent on the basis of the land register information, but unfortunately this does not seem to accurate. He asks who received the letter, and half of the participants raise their hands. The chairman apologizes for the incompleteness of the address database, and asks people to leave their names and addresses to complete the database. He asks again if everyone has the same perspective about this evening. The participants nod in agreement.

The presenter picks up his story again, and switches between the map and a PDF document. Sometimes he must scroll to the correct images, which leads to frowning faces of several participants. Many participants look puzzled. One participant asks more information about future losses resulting from government planning decisions and involved financial compensation procedures. The chairman explains that the RWA follows the formal procedures and that they distinguish between various forms of loss resulting from government planning decisions. The ensemble presenter says that his aim is to realise reverse losses, to which the PM jokingly responds that the RWA then would receive money. This gives rise to laughter from the audience. After the presentation, the participants are invited to respond. An participant asks what will happen to the Dalemse Sluice. The PM said that this is an artefact (in Dutch: kunstwerk) and that a separate design process will be followed. The chairman intervenes by explaining what an artefact means in civil engineering jargon, and warns that an artefact is not a statue or a painting or something similar.

One participant suggests the use of a modular barret system, as used in the dike reinforcement Kinderdijk - Schoonhovenseveer instead of the proposed retaining wall by the ensemble Linielandschap. The residents are interested in this technique. One of the context managers responds that not all wishes can be fulfilled, given the available budget. Some residents respond to this with understanding. A resident asks whether the context manager rejects the proposed solution. The chairman interrupts by indicating that at this stage it is all about generating ideas, not about rejecting them. The participants

agree that they are afraid that the perceptions around such a retaining wall will start leading a life of their own. They argue that the ensemble should opt for a removable barrier. Then a lively discussion arises on whether motorcyclists should be allowed on the dike. The participants have conflicting views on whether these motorcyclists were or were not allowed on the dike, and they react strongly during the discussion. At one point the chairman says that all options are still open.

Finally, the participants ask whether they can still become a member of the ensemble working group. The presenter explains that he regularly has meetings with another ensemble member and that he sends the progress of the ideas via e-mail to a wider group, after which he updates the documents based on their reactions. Until then no face-to-face meetings have been organised, but he invites everyone to participate and think along.

Interpretation, diagnosis & interventions: Similar to the previous community consultation meeting, the roles reversed during the meeting. At first the PT and ensemble acted as sender (S1) of the necessity of the dike reinforcement and the presented vision of the ensemble (K1), with the participants as receiver (R1). The participants' need (N1) was to learn about the progress of the dike reinforcement project and the ensemble ideas. At the beginning of the evening, several preconditions for the uptake were not met. The need of the residents (N1), did not correspond to the K shared by the ensemble and the project manager. This was caused by the lack of explanation of the setting of the evening: The receivers had a priori limited trust in the senders, because of the invitation letter. After the presentation of the ensemble ideas, the participants became sender (S2) of their opinion on the shared vision (K2), with the ensemble and PT as receivers (R2). The ensemble wanted to know which part of their vision would receive support from the residents (N2).

The researcher's proposed intervention was aimed at resolving the precondition of trust, as the participants thought that the RWA developed this vision. As a result, the chairman actively introduced the ensemble and the role of the ensemble for this project in more detail. After explaining the ensemble, he actively requested feedback as to whether the participants understood the role of the ensembles, after which they nodded. The change in the para-verbal and non-verbal behaviour of the participants after this intervention suggests that the preconditions were met. We also saw that the participants were willing to share their knowledge.

We saw a *transmission* barrier occur when the presenter kept switching back and forth between the map and a PDF document. This caused the residents to lose the storyline, so the message was not properly understood. *Cognitive* barriers seemed to arise when ambiguous concepts were used, such as 'building blocks' and 'artefacts'; both terms have different meanings for different groups of stakeholders. By explaining them, the chairman overcame these cognitive barriers. A *psychological* barrier occurred when the presence of recreational motorcyclists on the dike was discussed. The participants had conflicting views on whether these motorcyclists were or were not allowed on the dike. The participants had strong emotions on this topic. The chairman timely diagnosed this barrier, and explained that all options were still open. In the discussion about a modular barret wall or removable barrier, a *resources restricted* failure mechanism seemed to

occur when a context manager indicated that not all proposals could be realized in connection with the costs. He seemed to reject the idea because of the costs associated with the technique. However, the chairman remedied this failure mechanism, as he emphasized that in the idea phase all options are open.

During the meeting, the participants gave para-verbal and non-verbal signals that they felt that the ensemble was not open. Based on their questions, we realised that the ensemble was organised as an e-community. Partly due to the introduction of the ensemble during this evening, the participants maintained limit trust in the ensemble. Nevertheless, the questionnaire showed that 63% of the participants found the ensemble open and accessible, and a similar percentage supported the ideas of the Linielandschap ensemble, and 66% of the participants trusted the ensemble.

After this second community consultation, the researcher proposed the following adjustments based on our observations and diagnosis:

1. At the start of the community consultation meetings, explain the role of the ensembles and the participation process that took place, and explain that the primary aim of the meeting is to share and test the ideas of the ensemble with the participants, were the RWA acts as facilitator. Highlight what the overarching themes are between the five ensembles
2. During meetings, explain the vision of the ensembles by means of a slideshow (e.g. PowerPoint), instead of switching between a map and a PDF document.
3. During the interaction moments, avoid the use of technical terms that may have other meanings for residents, such as 'building block' and 'artefact', by PT members.
4. Specifically for the ensemble Linielandschap, ensure enough attention and openness of the ensemble by also organising one or more face-to-face meetings.

These new notions were then incorporated into the observation scheme for the next community consultation.

3. Community consultation meeting Haaften

Context: The third community consultation meeting (I_{41}) took place in the community centre of Haaften. Prior to this meeting, the context manager had several bilateral meetings with the ensemble, in which they told the PT that they did not want to tell the story themselves, fearing the potential consequences. The ensemble asked if anyone from the PT wanted to give the presentation during the meeting, and a context manager agreed to tell the story. The CM announced that he would put on a hat, to show that he would be playing a different role at that moment. Prior to the community consultation meeting, the researcher suggested that, in addition to the hat, he should also take off his jacket and roll up his sleeves to underline his role as a resident. In total 57 residents attended this meeting.

Observations: The chairman opens the meeting and emphasises that it is an evening where he feels like a guest, because the meeting was organised at the request of the ensembles. He explains that the RWA had previously asked the ensembles to develop ideas and wishes in such a way that the RWA can consider them in the design process for the new dike. He explains that the aim of this evening is to collect the reactions and

to receive additional input on the outlined solution directions of the ensembles. He tells that his colleague was asked by the ensemble to tell the story, because he regularly gives presentations, and the ensemble hence believes that he is better able to tell the story. The input received tonight will then be passed on to the ensemble. In the first presentation of the evening, the PM tells about the necessity for the dike reinforcement. His starting point is that 'the central government has opted for an equal level of protection in the Netherlands, which means that many dikes will have to be strengthened in the coming years'. He also stresses, that the climate is changing, and that the economic value in this area has increased considerably in recent decades. Furthermore, in recent years the engineers gained more insights in the behaviour of the dikes under extreme conditions. All this together, the PM explains, is the reason for the new dike reinforcement. 'The RWAs have the statutory task of ensuring that the dikes meet the legal standards'. 'The area where you live', says the PM, 'is an important point of attention for the short term. We want to limit the damage and casualties in the event of a flood. This is a major challenge'. Unfortunately during his presentation, the laptop used for the presentation malfunctions several times, and resolving these problems takes time. Finally, the PM continues and sketches the various dike failure mechanisms and the design process to develop a new dike design. 'But tonight, it is up to one of the ensembles to tell us what kind of ideas they have.'

The chairman asks the participants what they believe that ensembles are. A participant reacts that his first association is a music group. The chairman explains that ensembles are working groups, consisting of residents, who think along with the RWA about the surroundings of the dike and what should remain when the RWA has finished strengthening the dike. He outlines the process of the past year and the various meetings that have taken place, and explains that the ensembles are now engaged in consulting with their fellow residents about their vision. The subsequent step is to inform the administrators of municipalities, provinces, central government and other interest groups, as a prelude to a board conference, where the ideas are discussed with the executives. 'Not all ideas are related to dike reinforcement, and for this we, the RWA, also need other parties to be able to realise the ideas'. A participant asks the question 'to what extent the ideas of the ensemble will be realised: who pays, determines? And what is the value of the plans?' The chairman responds that they are curious about what is going on in the area. 'We realise that we are going to turn things upside down with the dike reinforcement. It also means an opportunity to create new things. We want to collect these new things. Not all requests will be honoured, but we will consider it, and we will take the plans very seriously'. This is followed by the question: 'which voice is most important?' The chairman responds that the so-called dike board of the RWA should determine the plan but that, at this very moment there are no weighing criteria for passing the plans. Another participant asked: 'If I would like to build on the dike (new construction) now, can I do so, or should I wait for the plans?' The chairman responds that a permit from the RWA is required, and the permit application will also be tested against the future and possible dike reinforcements. 'Each case is unique, and we want to look at the possibilities together'. The chairman recommends that they should also contact the context managers.

After this, the CM who volunteered to act as resident takes the floor, takes off his jacket, and puts on his hat. He starts by telling what motivated the working group: 'to make

Haaften more beautiful. The dike reinforcement is the starting point to make Haaften more beautiful, and also to remove old things. Several ideas that I will show are present in all five ensembles, including strengthening the quality of life in the village and on the dike, but also nature and recreation'. He mentions a few points of attention around the perception of the dike:' (1) saving the houses at the Kaap Haaften, (2) possibilities for rebuilding the houses that were demolished after the last dike reinforcement, and repairing the 'gaping hole', and (3) considering a dike relocation around the industrial park in Haaften – this is the most exciting – after which the old dike could become a green buffer for industry'. He says that the ensemble also sees possibilities to build houses. Participants react negatively to the ideas for this area and adopt a negative attitude. One participant asks, 'what about the municipality and the logistics company, since they are already in a legal permit process?'. The chairman reacts that they are in contact with the municipality, and that a dike relocation is certainly an option. The important question now is which ideas the ensemble can take forward and on which ideas they should no longer spend effort? A participant reacts that the vision is 'a dream of someone else, as the working group does not take others into account'. Some people ask who the working group members are. The chairman reacts that he does not know all of them, 'but that if we move on to the next agenda point and divide ourselves into smaller groups, they will probably make themselves known'. He explains that there will be five sub-groups, where people can react to ideas they support, ideas that have no potential energy, and possible additions. The groups appear to have misgivings around the ideas in the industrial park. Some people make repelling gestures and even walk away from the meeting. They say that 'there is no sense of reality in the ensemble'. Next, the residents share their knowledge in these five subgroups. Fruitful discussions arise, and in some groups the ensemble members explain why some ideas are suggested. The sub-groups give their comments and advice on the presented ideas of the ensemble.

The critique and advice from the five sub-groups shows that they endorse the ideas for nature and recreation, that the opinions about the reconstruction of houses are divided, and that there is doubt about the realism of the ideas around the industrial park, but that they support the overall plan. A participant again asks who the ensemble members are, as that did not become clear in his sub-group. The chairman reacts that probably no one from the ensemble was then present at his table. He expresses appreciation of the efforts of the ensemble and thanks them for their work so far. 'It merits applause '. At the closure of the meeting, the chairman talks about the follow-up process of linking ideas to those of regional partners.

Interpretation, diagnosis and interventions: The reversing roles of sender and receiver, the shared knowledge, and the needs were comparable to the previous community consultation meetings. The preconditions for knowledge transfer and uptake were appeared not to be met, as residents had limited trust. The residents had negative experiences with the regional authorities, as they felt that their ideas were not considered by the municipality and despite ideas they were simply pushed aside. In the sub-groups, the participants actively shared knowledge, and expressed, if applicable their concerns.

The ensemble members were *willing to share*, but did not want to present. To overcome this transmission barrier, their story had to be told by someone from the RWA. The limited openness about the members of the ensemble affected the precondition of

trustworthiness of the knowledge. The analysis of the questionnaire showed that 59% of the respondents indicated that they trusted the ensemble. This number was somewhat flattered because the ensemble members themselves also filled in this questionnaire. The residents had limited trust in the RWA, as seen in the questionnaires and the para-verbal behaviour during the meeting.

A *transmission* barrier occurred, when the laptop problems caused the presentations to run out of time. We also saw a *psychological* barrier when the ideas about the industrial park were presented. The participants experienced it as a passed opportunity that was not realistic. The responses from the participants were diverse: some thought it was an ideal image and would have liked it to be possible, others rejected the proposal. In the meeting, the participants showed *cognition* for the shared knowledge, as they discussed the ensemble ideas in the sub-groups.

Based on this community consultation meeting, the researcher proposed the following adjustments based on her observations and diagnosis:

1. Continue to mention the new approach around the ensembles, so that stakeholders will gradually start to realise that in this project the PT takes a very different community engagement approach.
2. At the start of the community consultation meeting, emphasize the similarities between the five ensembles, shown with their motto 'Our dike: safe and liveable'.
3. Timely discuss as PT with the ensemble, who will present the ensemble ideas in the external meeting and the board conference.

Comparing this meeting with previous community consultation meetings, we see that the earlier proposed interventions were taken up well by the project manager and the chairman. For example, the chairman now clearly outlined the position of the RWA and the purpose of the evening, and also carefully emphasized the position of the ensembles. During the evening, the chairman also asked some questions to see if people understood the shared knowledge. The project manager took the suggestions to heart about the necessity and approach of the dike reinforcement. He explained not only the position of the ensembles, but also that the necessity of the dike reinforcement followed from the obligation of the RWA to follow the national legal standards. He succeeded in conveying the image that the dike still met the requirements, but would no longer meet them in the future.

4. Community consultation meeting Tuil-Waardenburg

Context: Five days after the Haaften meeting, the community consultation meeting at the villages Tuil- Waardenburg (I_{42}) took place in the community centre of Tuil, with 25 residents present.

Observations: As he did in the previous community consultation meeting, the chairman indicates in the introduction that this meeting is organized at the request of the ensembles. The Tuil-Waardenburg ensemble would like to hear the opinion of the community on the developed plans to further enrich them. The PM explains the reasons for the dike reinforcement project. He starts with the notion that after the last dike reinforcement, the idea was that the dike would suffice for the next 50 years. The most important reason

that the dike needs to be strengthened is the new standard that has been in force since January 2017. Previously, there were major differences in safety in the Netherlands, notably in the Randstad, which is due to a difference in economic value. This is no longer the case. In addition, higher river discharges are expected due to climate change. The RWAs have a legal responsibility to strengthen the dikes such that they meet the legal standards. He shows a visualisation of the impact of the new standards, with this river area coloured red. While describing the dike failure mechanisms, he uses concepts such as the polder as a bathtub with the dikes as the edge. He also illustrates erosion by speaking of a sand castle on a beach washing away. He shows a map, that explains the dike failure mechanisms. However, the map does not zoom in on this particular area. He promises to show this later, but eventually forgets to do so. He further explains how the ideas are incorporated into the design process. He explains that the dike designers focus on location-specific characteristics, and that they do not focus on the cheapest solution, but also on other effects. 'After all, we cannot strengthen a dike with a stack of paper'. The participants react reservedly. The chairman recalls the process in the past year and gives a glimpse of the next steps.

Then, an ensemble member takes the floor. He tells that some residents have started collecting ideas around the trajectory Tuil- Waardenburg. He emphasizes that these are ideas of only a few residents. 'At first', he says, 'it looked as if this area would fall outside the scope of the project, but after insisting, the RWA agreed that ideas could also be developed for this area'. The presentation then begins with a short introductory film. The ideas of the ensemble focus on improving traffic safety and the connection of the village of Tuil to the dike, where the N830 is now seen as a major obstacle. Other proposals include realising more hiking paths in the floodplains, fibreglass and street lights on the dike and finally, customisation is required around the 'Sluishuis', where the wish is to deepen the old strung. This last point triggers a strong reaction from the participants. When during the break the chairman asks why there was such a strong reaction, the participants indicate that there is a lot of scepticism towards the RWA, as the RWA had said that this was not possible. After the break, the chairman mentions that he is aware of the emotions around the 'Sluishuis', but that the RWA will look when and how they can incorporate the comments in the re-design process. More participants start sharing their ideas, and they openly discuss the ideas with each other in sub-groups, and enters an organic conversation with each other and discusses the good, undesirable and additional points on the vision of the ensemble. The chairman intervenes plenary on a few points by explaining the rules of the game and that comments and advice will be requested per sub-group on what is still lacking. The positive points that emerge include improving traffic safety, and 'the village Tuil behind the trees'. The participants react sceptically to the ideas around the roundabout at Tuil, as the residents have some negative earlier experiences with the municipality. Red stickers are placed at a company that is located within another ensemble area. Everyone experiences that the vision sketched or developed by the ensemble is correct. During the plenary conclusion, the chairman asks several questions as to see whether certain subjects such as recreation have been sufficiently addressed. This leads to a few reactions concerning the health of the livestock due to dog faeces, as the participants fear this. They are also worried about the increase in freight traffic movements along the dike. Shortly after that, the meeting is closed.

Aftermath: After the meeting, the residents discuss the presented ensemble ideas further, and they say that they hope that several ideas are brought further in the future. The researcher suggests, after the meeting, to make a few nuances to the presentation of the PM: (1) find a better balance between the new insights and the new standards in relation to the last dike reinforcement, and (2) repeat the importance of the chosen intensive participation process approach, so that all participants become aware that this innovative approach is innovative and different from what they have experienced to date.

Interpretation, diagnosis & intervention: The preconditions for knowledge transfer and uptake were met. The ensemble and the project team acted as senders (S1), but this role changed when the participants (first R1, now S2) were asked to react to the vision of the ensemble (ensemble as R2). The needs were comparable to the previous community consultation meetings. Trust in the RWA was limited; this was made clear, among other things, by the reaction around the 'Sluishuis', where people addressed old emotions. The questionnaire showed that 86% of the respondents had trust in the ensemble and its members.

The *psychological* barrier occurred when traffic safety was discussed, more specifically the nuisance caused by lorries of a nearby logistics company, but also on the suggestion to create walking paths in the floodplains, where participants said that there would be an increased risk of sick cattle. The participant could not oversee the consequences such as the impact on third parties (employment, public health), which made them less receptive to these ideas. The residents felt that the ideas around the Tuil roundabout could not be realised, due to the attitude and existing rules of the municipality and province (*institutional restrictions* failure mechanism), as they had different experiences with the working methods of the province and municipality. The participants embraced the idea around the 'Sluishuis', but due to the earlier attitude of the RWA, they rejected the idea (*diffidence* failure mechanism). The uptake of the knowledge reached the level of *cognition*, as residents actively shared and discussed the shared knowledge. The questionnaire also highlighted that 52% of the respondents supported the plans of the ensemble.

Based on this community consultation meeting, the researcher did not propose any additional suggestions to enhance the knowledge transfer and uptake. She did saw the PM to adopt the earlier proposed adjustments, although the PM put again too much emphasis on the new national legal standards. The researcher linked the closed attitude of the residents during the PM's presentation to a lack of trust (T), whereas the more open attitude towards the ensemble was seen as an indicator of a higher trust level. The trust in the PT increased during the evening, also due to the chairman as he regularly mentioned arrangements, rules of the game and asked whether the shared knowledge was clear. This proactive open attitude of the RWA helped, especially because they kept repeating the new chosen approach, which suggest the success of this earlier proposed intervention.

5. Community consultation meeting Herwijnen

Context: The community consultation meeting in the village Herwijnen (I_{45}) took place at the GeoFort in Herwijnen, one day after the community consultation meeting of Tuil-

Waardenburg. The ensemble expected a large turnout of approximately 100 residents from the village Herwijnen. The project team asked for extra support from the RWA to write all their remarks on the maps of the ensemble.

Observations: As with the previous community consultation meeting, the chairman explains the rules of the game and the reason for this evening. He emphasizes that the RWA is only the facilitator of the meeting. The PM then explains the usefulness and necessity of the dike reinforcement. During his presentation the chairman adds that there could be many casualties and damage if the dikes break through. At that moment, the PM emphasises the statutory task of the RWA. He then explains how a dike can fail and how a dike is designed, and during his presentation, a context manager explains why the RWA finds the daily management of the dikes, and the expandability for the future so important. He talks about the nuisance that residents can experience during the construction. 'The participation process that has been initiated is worked out step by step and coordinated with you', he explains. Several participants ask whether the measures already taken to make room for the river are insufficient. The project manager nods. A participant then asks if 'in a few years' time new insights might be available, which means that you will come back in a few years' time'. The PM reacts that there is always a probability that in a few years there will be new insights about the strength of dikes. He emphasizes that the number of casualties and damage in this area will be large if the dike breaches. Another person sketches the picture that in the years 1972/1973 the first dike reinforcement was carried out here. Then people were happy. The dike reinforcement after the high tides in 1993 and 1995 led to strong emotion from the residents. The dikes are oversized after the dike reinforcement in the nineties. The residents raise the question whether it is necessary to raise the dikes even further. He is not convinced of the need, and some others in the room agree.

The chairman then gives the floor to the ensemble. With the first slide, one of the ensemble members explains that the ensemble working group realises that they cannot stop the dike strengthening. 'However, this process does offer the ensemble working group the opportunity to turn a necessity into a virtue by taking the opportunity to make the dike more beautiful'. The ensemble member says that 'while there may be people in the room who hope to hear tonight what is going to happen to their properties, the RWA does not yet know what is going to happen to your property, and nor do we!' He explains the rules of the game again, namely testing the ideas, retrieving additions or desired changes, and explaining the working method of the ensemble Herwijnen. He explains that along the dike between Gorinchem and Waardenburg, five ensembles have developed ideas; together they developed a shared motto, and have 10 themes in common that all ensembles find important. First, he shows a photo of the members for each subarea. He then explains that the ensemble Herwijnen split the dike stretch into four additional subareas. The ideas for each subarea will be explained by different ensemble members. In the *Pieterswaard* area, the ensemble member tells us that there are ideas to keep the statue of the *SteenKruier,* as various marriages have been arranged here, which results in laughter from the room. In addition, several ideas are put forward about certain dike reinforcement techniques. The presenters stress that they are not engineers, but that they expect that in future discussions with the designers they will learn what is possible. In 't *Rot* the dam of rubble (in Dutch: *puinrug*) is mentioned, and that they see opportunities to make more room for the river by digging a trench. They

also propose to switch between strengthening the dike towards the river and in the polder, in an attempt to save houses. Participants react that this will never work, and they ask questions whether the owner of the site outside the dikes is already informed on the ideas. An ensemble member tells that this is not yet the case. The participants wish the RWA good luck given the previous experiences with this owner. One participant asks more information on the maintenance of the dike. Some residents claim that the RWA is currently carrying out insufficient maintenance. The chairman responds that maintenance is important, but that next to the RWA, more parties are responsible. In the '*Boveneind*' the ensemble wants to preserve the campsite and increase recreational opportunities. They argue for the preservation of some items, such as a specific chestnut tree. The presenter indicates that Herwijnen does not require innovations at many locations, but the proposed retaining wall should still be possible. He says that the 3D visualization made by the landscape architect hired by the RWA is not as desired, but that fortunately an ensemble member has made a clearer the 3D visualization. At the location of the chest nut tree, the ensemble proposes to construct the innovation of water relaxants. 'You don't know what this is, but it is a technical solution'. At *Moleneind*, topics such as recreation, sustainability and traffic safety are mentioned. After the coffee break, the participants are divided into four subgroups and everyone in their own area reflects on the ensemble proposals, where lively discussions arise, and the ideas are written on the maps by an RWA employee. During the evening, the ensemble gains support for their proposals.

Aftermath: A week after this last community consultation meeting took place, the two CMs and researcher have a joint evaluation meeting (I_{47}) where the researcher shares her findings. She argues that the differences between the ensembles can partially be traced back to the historical and cultural roots of the communities. Their experiences with the RWA or other authorities determined the attitude of the residents and their trust in the authorities. The presenter and the position he or she holds in a community contributed in part to the transfer and development of knowledge. The EL of Vuren, who was seen as the 'informal mayor', was highly trusted, whereas in Haaften the ensemble members asks a PT member to present their ideas. During the five community consultation meetings, the PT and the ensembles gained valuable insights that could be used in the board conference,

Interpretation, diagnosis & interventions: Similar to the previous community consultation meetings, the ensemble and the PT acted predominantly as sender (S1), while sharing the vision of the ensemble and the necessity of the dike reinforcement (K1). The participants wanted to learn more about the proposals from the ensemble to the RWA, and whether more was already known about the dimensions of the new dike (N1). The roles reversed when the residents (as S2) commented on the ensemble ideas to the ensemble (as R2). The ensemble wanted to know which ideas were embraced in their community and what other ideas the residents had to further enrich their vision(N2). The preconditions for knowledge transfer and uptake were met. The mutual trust (T) between the residents was high, as can be seen from the high number of people present: more than 100 residents. The questionnaire revealed that 85% of the respondents trusted the ensemble, and knowledge was actively and openly shared during the evening.

At one point, despite the efforts of the project manager, several residents questioned the necessity of the dike reinforcement, suggesting a *psychological* barrier. We observed that the need to strengthen the dike did not match the perspective of a few residents. In addition, some participants believed that the rules of the game were changed as soon as new knowledge becomes available.

The ensemble also proposed to strengthen the dike towards the river, which was immediately rejected by the participants, as they could not believe this possibility due to the expected attitude of Rijkswaterstaat, anticipating the institutional failure mechanism. The knowledge transferred during the speed course (cf. chapter 5, thread V) about the different strengthening techniques reached the level of adoption, since the ensemble incorporated it in its vision. The uptake of the necessity to strengthen the dike (K1) reached the level of effort, as this was the starting point for the ensemble. 80% of the respondents indicated in the questionnaire that they supported the proposals of the ensemble.

Similar to the 'walk-in' meetings in section 5.1, the series of consultation meetings in this thread shows the classical action research approach. In the 'walk-in' meetings, the TM gave the presentation about the necessity of the dike reinforcement, and the PM told about the planning of the project, whereas in the community consultation meetings, the PM presented both topics. The role of the PT was different in this thread in the walk-in meetings they were the initiator of the meetings and actively shared their knowledge, whereas in the community consultation meetings, they only facilitated the meeting, while the five ensembles acted as host, and invited the PM as guest speaker to tell more about the necessity of the dike reinforcement. In the course of the successive community consultation meetings, the PM improved his presentation, partially in response to the observations and suggested interventions by the researcher. The researcher was able to intervene via the chairman to enhance the knowledge transfer and uptake, showing how effective real time interventions can be to mitigate barriers and failure mechanisms.

Thread VIII: The value of placing a sticker on an ensemble proposal during the board conference

In this thread, the researcher sent a questionnaire to all participants prior to the board conference (I_{59}), collected the response, and then held a survey directly after this meeting. The researcher did this to learn more about the expectations regarding the board conference, and how people saw each other's roles in the process.

Context: In one-year time, ensembles have worked hard to develop a vision of the dike in its surroundings (cf. threads I, III – VII). They shared, enriched and discussed the proposals with the community members, the administrators, and other ensembles. While preparing the board conference (I_{59}), the PT and the ELs divided the ensemble ideas into five themes (cf. thread IV of this chapter). The purpose of the board conference was: (1) to jointly determine which parts/building blocks of the plans/visions of the ensemble working groups belong to the design process of the dike reinforcement, and (2) to also determine which parts/building blocks fall outside the framework of the dike reinforcement, and whether these will be taken up by another stakeholder or combination of stakeholders. This makes the scope of the board conference broader than just the dike. Therefore, the

PT also invited executives in charge of spatial planning, recreation, nature development, or traffic to the conference, in addition to the executives already involved in dike reinforcement (the EMG members). During the board conference, 25 compilations of ideas of the ensembles would be discussed with the executives. For each proposal, the executives would be asked to consider whether the proposal fitted with their own policy programmes, and whether they saw possibilities to take the proposal further, potentially leading t additional agreements with other governments. The attending executives would be invited to express their support for a particular compilation by marking it with a sticker. After the board conference, these ideas would be further discussed with the stakeholders who placed a sticker behind the ideas. Prior to the board conference, the RWA held various bilateral meetings with aldermen to convince them to attend the board conference, and to explain that 'stickering did not mean that the proposals would actually be implemented'.

The researcher sent a questionnaire via e-mail in advance to all participants, including the executives and ELs, with the aim of finding out (1) the information needs of the participants prior to the conference, and (2) the roles that the parties involved could play in the period following the conference.

Observations: The independent chairman of the board conference starts the meeting by stating that he had to think of a specific children's book while preparing this meeting, because he feels that it relates to the process at GoWa. ´It is an adventure book, and we are also working on an adventure here; the book is about overcoming obstacles and we will know those too, here at GoWa; and finally, it is about friendship and mutual trust and perseverance. It would be nice if we could continue to build trust, but also be aware that we must do it together. It doesn't stop today, today is actually the beginning.'

After the introduction, one EL takes the floor and talks about the process of the past year, while expressing that he was glad to see that the ideas of the 5 ensembles overlap, and have a common motto and slogan. Furthermore, he explains that the ensembles understand that not all proposals can be realised during this dike reinforcement. However, he asks the executives to choose the new dike profile such that the proposals that have not yet been accepted will remain possible. The chairman then continues to highlight the outline of this meeting and again explaining the stickering process: 'This [placing a sticker next to a compilation of ideas] means actively thinking along, exploring the feasibility and, where possible, facilitating on an official/administrative level. A sticker does not therefore mean 1) already a commitment to proceed to realization, 2) already a commitment to finance, or 3) already an assertion that it is politically or politically feasible'.

All 25 proposals are presented thematically via a pre-recorded video. After each video, the executives are invited to place a sticker behind the ideas. During this process, several executives indicate that they have comments on specific proposals and that these comments remain invisible when they just place a sticker. The chairman repeats his earlier message and says that it is now not about making promises, and that their comments can be taken into account in the next steps. One executive says that for two specific proposals 'I question the political feasibility; on the one hand I consider these proposals important and find them promising as an individual, but on the other hand, I

have questions about the feasibility within my municipality.' He says that he therefore finds it difficult to decide whether or not he should place a sticker.

Ultimately, all proposals receive at least two stickers from the executives. Some compilation of ideas, such as nature, receive stickers from all executives. The PT promises to record the results of the board conference in a progress document, which they will share with all participants. They tell that a press release will be drawn up, in which the results of the board conference will be reported.

Aftermath: The objective for the follow-up is that the proposals will indeed be taken further. Therefore, the PT and later the alliance develop a progress document in which the steps and agreements made are recorded. To keep all parties involved and informed, this progress document is each time discussed in the meeting of ELs, SBG, AMG and EMG.

Afterwards, the researcher analyses the received questionnaires, and sees that the perspectives of the parties differed from each other. The response of the ensembles shows that the tasks and responsibilities between the authorities for residents are far from clear. The RWA sees – logically – an active role for the other authorities in bringing the proposals forward, while requesting additional sources of funding. The municipalities see a role for the Provinces and the RWA in financially rewarding the proposals. The DFPP Programme Board believes that the municipalities and provinces play a role in obtaining administrative and financial commitment for the realisation of ideas that do not belong to the design process of the dike. In addition, the Province also plays formal role in reviewing the project plan in the project phases under the Water Act (*Waterwet*), and Rijkswaterstaat should make a statement about the possible conflict of opportunities for coupling with their Great Rivers Policy (*Beleidslijn Grote Rivieren*). In the meeting itself, the differences did not lead to any problems. The questionnaire showed that most executives wanted to take the ideas on the various themes further. Those who indicated that they did not want this, did so mainly because they did not play any (formal) role in that domain. The thematic views developed by the ensembles appeared to fit in well with the programmes and policies of the attending organisations.

The ambiguities surrounding the roles of the authorities involved become later visible in an ELs meeting (I_{84}) (cf. thread XIV, chapter 4). In this meeting, the ensemble members raise the question what the differences were in the tasks and responsibilities between the municipality and the RWA. The division of roles did not become clear during the earlier meetings. The researcher then advised to define the roles of the involved governments clearly at the beginning of the participation process, and continue to highlight the differences in their task and responsibilities, for example through a factsheet.

Interpretation, diagnosis & intervention: We identified various senders and receivers in this interaction moment. First of all, the chairman on behalf of Rivierenland was the sender (S1) of the meaning of a sticker. He shared process knowledge (K1) with the executives (R1), who wanted to know the script for the meeting (N1). A second sender was the ensemble leader (S2) who shared knowledge about the ensemble process (K2) with the executives (R1 = R2). The need of the executives was then to see where the ideas can strengthen their own policy and to increase the quality of life in their management area (N2). This knowledge about the process support the chairman's statement that the

ensembles understood that not all proposals would be realised. Finally, the executives were the sender (S3) when they started stickering, and the PT and ELs were the receiver (R3), having a need to learn which proposals were favoured by the executives (N3). The preconditions for knowledge transfer and uptake were met, as the senders were *willing to share* knowledge, which also suggests basic trust (T) among participants. In addition, knowledge sent by executives and PT members was trusted on the basis of their public office, and the belief that they perform this office following rigorous procedures. The knowledge sent by the ELs was trusted on the basis of past performance and constructive attitude.

Throughout the meeting, executives repeatedly asked what the significance of a sticker would be. This suggests that the executives were afraid of errors of judgement when placing stickers, as they are politically vulnerable. It may also be a sign that they were reluctant because of consequential damages if they would take up the proposals. This *resources-related* failure mechanism was remedied when the chairman repeated his message that the executives would further explore the feasibility of the proposal. Not all executives asked this question, indicating that some executives understood K1, suggesting that the uptake of K1 varied in level between *reference* and *effort*, depending on the executive. The PT paid a lot of attention to the script, and partly because of the bilateral consultations held beforehand, the executives felt that they were in a safe environment. The emphasis on 'no commitment, only a reality check' was a good example of loose coupling (De Bruijn & Ten Heuvelhof, 2002).

Thread IX: Continuing the participation process after the start of the alliance

This thread shows how we can use the FODIKI framework effectively to predict potential barriers and failure mechanisms before a meeting takes place by analysing the script.

Context: Before the start of the Graaf Reinald Alliance, the context managers and the researcher openly discussed with each other (I_{65}) about the previous months and how the participation process could be continued. They developed a script for the so-called 'design tables', in which residents and ensemble members can participate, but also, if desired, municipalities and interest groups. After the start of the alliance, CM1 shared this with the involved alliance partners. During the summer break, the alliance further developed all kinds of ideas for to continue the community engagement approach. However, because the varying perceptions of the organisations within the Graaf Reinald Alliance had to be brought together, *and* because of the holiday period, these ideas were only partially shared. Initially, the other alliance partners believed that the starting document that had been drawn up by the PT and ELs after the board conference, would suffice, and that the active role played earlier by the ensembles was no longer necessary. During the summer period, the alliance decided to organise a series of 16 participation meetings for residents to clarify the next steps in the design process. The alliance wanted to learn from the residents what they saw as possible dike reinforcement solutions and what they found important in their neighbourhood. In the first invitation letters, these meetings were called 'design meetings'. In contrast to previous residents' meetings, the structure chosen for these evenings was not discussed in advance with the ELs and/or the SBG, and the invitation to these meetings was sent without their involvement.

In the participation meetings, the alliance would first give two presentations: (1) a context manager would tell more on the next steps in the design process, and (2) an engineer would tell about the dike safety analysis. After this, the residents would be split up in groups to talk about the dike close to their homes or properties in more detail, supported by an alliance colleague. Based on this script for these participation meetings, the researcher had drawn up a hypothesis in advance, where she predicted the occurrence of transmission, cognitive and psychological barriers and several failure mechanisms. She also indicated that residents would find it difficult to share their perceptions, as no visualisations of possible dike strengthening techniques would be on the table. Prior to the meetings, the researcher shared this with CM2 (I_{119}), who himself had no role in the preparation of the meetings. The researcher highlighted that the residents were the main sender during these 16 meetings, whereas the invitation letter suggested that the alliance would share new knowledge. Emphasizing the importance of trust of the residents in the PT/ alliance, she strongly advised CM2 to explain to the residents why they organised these meetings, namely to give the new alliance colleagues a head start with the already shared local knowledge of the residents. The researcher asked CM2 to observe and try to diagnose based on the predicted behaviour. At the request of CM2, the researcher explained and clarified the framework once again.

Many of the attending alliance colleagues were new to the process, while only few colleagues from the original PT attended these meetings. Due to agenda restrictions, the researcher only attended three of the 16 meetings, but the CM2 attended them all. In this specific interaction moment (I_{67}), where the researcher observed, we focus on the knowledge transfer at one of the tables where the residents talked about a concrete dike section where small local businesses were located outside the dike in the floodplains.

Observations: One of the alliance employees explains how he normally looks at such an area as a contractor: he wants to relocate a certain company which is in the floodplains and explains other options. This company owner explains that he recently made large investments and that these must be recouped for business operations. The residents start talking about this specific company, while the owner of this company visibly withdraws from the conversation, making negative gestures. At a certain moment, the CM asks the company owner whether he feels attacked. The business owner nods. The CM explains that nothing is decided but that such a conversation helps to see what the possibilities are, and that it is purely exploratory. The CM explains that the RWA wants to design the design process openly and transparently, but he also realises that this can seem threatening. The company owner reacts that he 'has lived on the dike for more than 25 years; the import residents have no right to speak.' During the remainder of the evening, other possibilities are discussed, and the company owner actively participated and shared his ideas.

Aftermath: During the next ELs meeting (I_{75}), the chairman asks about the experiences of the ELs at the held participation meetings. One of the participants says that many residents indicated that they had been misled by the invitation letter. The residents thought that they would hear more about the spatial impact of the dike redesign. An EL indicates that the residents felt that they were being asked to repeat information they had already given earlier that year, more specifically in January during the community consultations. He tells that people felt attacked, and that they were 'forced' to think

about someone else's property. A company owner was unpleasantly surprised when they started discussing his land and company. Another EL said that during the meetings 'neighbours were set against each other while this is not yet on the agenda and the residents did not appreciate it'. The ELs agree that the residents have become cautious about the chosen approach and do not experience that the earlier shared information was used. The ELs indicate that they would have preferred to have thought about the content and script for the meetings in advance. They believe that the damage caused to the process would have been less. The ELs ask the context managers how they experienced the meetings. A CM then tells that they themselves were quite satisfied with the meetings because they gained a great deal of information, heard what residents consider important, and recorded this in fact sheets. In addition, they received a great deal of information that enabled new alliance colleagues to quickly become familiar with the local circumstances. In the subsequent SBG meeting (I_{78}), one of the SBG members indicates that he clearly sees differences in approach before and after the summer break. 'The participation process has become different and more unclear in this new phase. We want to return to the feeling of trust we had. I have the feeling that we are back to *divide and conquer*. The collective track seems to have been abandoned and people are currently more interested in their own interests'. Some SBG members speak of a necessary effort to regain the resident's trust. Immediately after the meeting, the context manager tells the researcher that the comments from the SBG made him realize that the hypothesis drawn up in advance by the researcher had indeed been confirmed, that trust is important. He also has the impression that the alliance lost some of the trust of the residents during the meetings.

In the next three series of residents' meetings, in November (I_{82} and I_{83}) and March (I_{97}) and September (I_{120}), we see that the alliance learned from its earlier 'mistakes'. They ask more emphatically for feedback from the ELs and SBG members. However, during the design and execution of the script, we still see various barriers and failure mechanisms occur. The alliance experiences a dilemma in keeping the promise to let the residents participate in the design process: a tension arises between open and transparent information for residents and wanting to tell too much such that the residents walked away from this process. In these meetings, the ELs and SBG members reflect on this dilemma, strongly advising the alliance not to tell too much, as the residents can only absorb a certain amount of knowledge per time. One SBG member says that 'it takes time for all parties involved to internalize the new approach with all its nuances. In this phase of the project, the focus lies on building trust between the alliance and the residents, authorities, and other interest groups'. The researcher sees that learning by experience only partially takes place by the alliance, as they took too little time to internalize the gained knowledge around the community engagement approach.

Interpretation, diagnosis & interventions: During the meetings, the residents acted as receiver (R1) in the plenary part, with the alliance as sender (S1) of the procedural (design process) and substantive knowledge (safety analysis). In the remainder of the meetings, the residents predominantly acted as sender (S2), and the alliance as receiver (R2). The alliance wanted to learn more about the local characteristics of the dike (N2). However, the meeting did not meet the needs of the residents, as they expected that they would learn more about the dimensions of the future dike (N1), and that they would start designing during this meeting. A mismatch occurred in the needs of the

residents regarding the knowledge sharing from the alliance to the residents, such that the preconditions for knowledge transfer and uptake were only partially met.

During the meeting, the residents blamed the alliance for forgetting the knowledge they had already transferred (*dissipation* failure mechanism). The residents indicated that they had already shared this knowledge during the community consultations 8 months earlier. However, the purpose of those consultation meetings was that the ideas of the ensembles could be enriched, and the PT did not write down their ideas, as they only facilitated those meetings.

In an ELs meeting, the ELs told the reflection of the residents and said that they had rejected the chosen process approach, because it did not pay sufficient attention to the *protection of core values*. The uptake by the RWA of the K2 was high, as the input would influence the choice of promising building blocks, with an uptake (U) level of *adoption*. As residents clashed in the subgroups, they rejected the chosen design approach of the alliance. This led the residents to lose trust (T) in the alliance. Residents experienced that they were not taken seriously, diminishing their *willingness to share* knowledge, a precondition for knowledge transfer in the following interaction moments.

We saw in this example that when a chosen script does not meet the expectations of the participants, this can have far-reaching consequences for knowledge uptake. The example showed that the RWA was quite satisfied with the knowledge received, with a high knowledge uptake, while the residents had become more negative about the approach and working method of the alliance, because they expected something else from the meetings.

The pre-shared hypothesis turned out to correspond well with the remarks made by the SBG members and ELs. In the case of the company owner, we saw that the alliance did not protect his core values leading to an unsafe environment at first. Due to the intervention by the context manager, the trust of the company owner in the process was restored, after which he actively participated in the discussion.

Thread X: Series of meetings from the EL, SBG, AMG and EMG

In this thread, we look at the series of meetings (ELs, AMG, SBG and EMG) that took place just before the summer of 2018 and describe in total six meetings ($I_{106\text{-}114}$), while working according to the action research spiral, proposing changes during as well as after meetings to enhance the knowledge transfer and uptake throughout this series of meetings.

Context: During an earlier series of meetings (ELs, AMG, SBG and EMG) in April (thread VIII, chapter 4) participants indicated that they disapproved the approach of the alliance. The EMG requested that the alliance (and thus the RWA) would take a step back and first develop a common vision for the river area with their partners. This gauntlet was taken up by the alliance manager, who started discussions with the project partners to work from a shared perspective. As an intervention after the last series of meetings ($I_{98\text{-}101}$), the alliance chose to look more explicitly at the residential enjoyment theme and to include this in the considerations for the preferred alternative. For this purpose, a consultant

from the alliance was brought into the project to further specify this theme. The Graaf Reinald Alliance makes a distinction between affected and non-affected houses, affected meaning that additional research was needed to determine whether the houses, gardens or garages located on someone's property needed to be demolished to make room for the dike reconstruction.

1. Bilateral meeting advisor and researcher

Context: The consultant residential enjoyment wanted to exchange ideas with the researcher because he believed that the researcher might have a relevant perspective on the theme, even more so because the researcher had been involved in the project for quite some time. In their first interaction moment (I_{105}) the consultant shares his insights about residential enjoyment with the researcher.

Observations: The consultant tells that residential enjoyment is about the experience of the area around the house, which is measured qualitatively. 'We, as alliance, want to prevent it becoming a yardstick. For all 51 dike sections, we took an average for the enjoyment of living. We realise that this does not seem fair to the individual resident. It also concerns the houses that are not affected, since the affected houses depend on so many aspects'. The consultant explains that they have looked at the dike sections where many houses might be demolished, leaving only a few behind. Here, residential enjoyment scores lower, because social cohesion is disappearing. 'We assume that the residents experience social cohesion. In this project phase, we made assumptions how to include this theme. This also means that in the next phases, this theme must return, and then it must be considered properly and seriously. Then it can vary per resident, and we must be careful not to set a precedent. Compared to a few months earlier, we have made this concept explicit; previously it was included implicitly'. The researcher asks how the advisor wants to bring this subject to the ELs and what he wants to achieve during this meeting. The researcher points out that the Provincial and RWA elections next year may play a role in the continuation of the project and how residential enjoyment will continue to play in this project. The consultant says that this is a good point, and continues that he wants to tell what steps have been taken so far and how the alliance wants to incorporate this theme in the future. For this, he plans to ask the reactions of the ELs. So far, they have used the views submitted to the NRD as input, and they are now looking for ways to include this theme in the follow-up process. The researcher asks a few questions as to whether the role and position of the ELs is clear, also in relation to the sounding board group. The consultant says that he received some information, but encourages the researcher to elaborate on it. The researcher explains that there are five areas for which residents have developed a vision, and that the leaders of these ensemble working groups do not necessarily have to be residents on the dike, but do organise the supporters and pass on their concerns in the dike reinforcement process. She explains the differences in roles between the ELs and SBG. The researcher then asks about the economic value and loss of value due to the dike reinforcement, as she had heard similar questions from the ensembles in previously organised ELs meetings. The consultant responds by explaining the economic value in relation to residential enjoyment in more detail. The researcher suggests that the way in which the residential enjoyment theme is introduced in the ELs meeting is important, as the expectations by the ELs are high, thus creating a potential tension for this theme.

Interpretation and diagnosis: The roles of sender and receiver changed during the meeting. The consultant (as S1) shared knowledge (K1) around the residential enjoyment theme with the researcher (as R1), and the researcher (as S2) shared her observations and findings around the community engagement approach (K2) with the consultant (as R2). The researcher was interested to know how the consultant defined the residential enjoyment theme (N1), as this could help her to further specify potential interventions for future meetings, whereas the consultant aimed to learn (N2) how the residents participated in the overall process, such that he knew how to prepare for the next meeting. The researcher and consultant were willing to share knowledge with each other, and the knowledge sent by both was trust, on the basis of past performance and reputation. They shared experiences and views of the GoWa projects. Through feedback, they both (in their roles as receiver) communicated on the metal level, whether they understood the shared K, and pointed out *cognitive* barriers that might occur between the alliance and the ELs. We did not see barriers occur between the consultant and the researcher. In preparation for the upcoming ELs meeting, the researcher suggested that the wordings used by the consultants should fit the needs of the ELs, to maintain trust and thus the preconditions for knowledge transfer and uptake.

2. ELs meeting

Context: The researcher repeated the most important insights from her meeting with the consultant for residential enjoyment to the context managers (I_{107}) prior to the ELs meeting (I_{108}), that took place later that evening. The context manager sought support from the ELs for the way the alliance defined residential enjoyment. In preparation for this meeting, the CMs sent the following documents to all ELs: the minutes of the last meeting (I_{99}) and the progress report, in which the progress of the ensemble proposals was documented

Observations: An EL asks, before the meeting is opened by the chairman, when more information about the dike sections will become known and whether the residents can help puzzling the solution together. The context manager explains that the alliance will make the choice, but that they are more than prepared to listen to the suggestions of the residents and to tell them more about the design process. After the kick-off of the meeting, the participants discuss the minutes made of the last meeting, and the ELs are unable to recall certain actions from the previous meeting (I_{99}), including their suggestions for locations where ribbon development used to be and where the ensembles want this to return after the planned dike reconstruction. In the discussion, the ELs tell that they cannot simply point out these locations since several, sometimes conflicting, interests play a role. The ELs ask the alliance to isolate these locations. An EL expresses that he had forgotten the other action he had promised (to organise a meeting on sustainability), but will start to make the arrangements, and again asks who should be invited.

One EL highlights that they have recently internalized the next design steps. He tells that several alliance employees had good discussions with residents, which created better understanding for the next steps. One participant says: ‘It is a logical way of working for me and they were able to explain it well. I personally have confidence in it. I’m not going to do their work again’.

The ELs ask, similar to the previous meeting, questions about innovations and when the alliance will incorporate these into the design. The context managers give a recap of the last EMG meeting: an interim step is taken because several EMG members requested a spatial vision on the river Waal, since spatial integration is becoming more important. The Province of Gelderland is developing a vision on the dikes of the next century, with the cooperation of the Province of Zuid-Holland. This will then be translated by the alliance into a vision for this specific dike, presented to the SBG, and then to the AMG and the EMG. ELs ask how the EMG will deal with this vision in relation to current stage of the dike design process. The context manager sketches that the alliance has continued its work, for 'the fact that the EMG is taking its time to consider which does not necessarily mean that we cannot continue'. The ELs ask about the role of the SBG. The context manager replies that the role of the SBG is influential since they directly advise the EMG, and the executives followed up on the SBG's advice in the previous EMG meeting.

The consultant on residential enjoyment explains the theme, says that they defined this based on available documents, and describes how this theme will be used while developing the preferred alternative and in the subsequent project phases. He stresses that this theme will grow in importance in these phases. For now, he has made a first inventory for each dike section. The consultant says that there are 'people who come nastily out of the dike reinforcement'. Due to his wording, some ELs react visibly shocked, after which they seem to react apprehensively to the subject, and emphasize that this subject must continue to return on the agenda, and whether the consultant can be present at every meeting to discuss the progress of this point. CM1 promises to organise a meeting with special attention for the construction phase this autumn to give more information on this topic. The other context manager reacts somewhat surprisedly to this promise, and discusses this briefly with CM1, while making negative gestures.

Then, the CMs and ELs continue to discuss the progress of the ensemble proposals, for which the CMs had drawn up a progress report. The chairman explains that the ensemble proposals that are considered feasible must land in the implementation agreements with the involved partners. He explains that the colours in the report indicate whether the planning for this can be achieved. The ELs react enthusiastically to the 'realisation sign', as the alliance used the visualisation of the ELs' vision and motto in the report. The chairman says that it appears that many proposals can be considered, but some cannot. The ELs say that they are still looking how these proposals can be adopted by governments. In this meeting, an EL repeatedly highlights and cites their plans for a specific industrial park. The context manager responds that the alliance is still investigating whether the dike can be relocated, possibly resulting in less nuisance for local residents.

The ELs say that they want to share with the executives that they are positive about the process they embarked on, and stress that they should celebrate the successes together. During the remainder of the meeting, the context managers sketch the process towards the preferred alternative. The chairman explains that the people that will be affected will be informed personally. 'Everything should be known before 21 August. After that, we will organise a meeting in which everyone is invited to talk about the public interest. After all, the affected residents have already been informed. Especially for the people who are not affected, we will organise a larger meeting, because it is not about the personal interest.'

Interpretation, diagnosis and interventions: During this meeting, the context manager (as S) shared the progress of the ensemble proposals and the progress of the preferred alternative (K) with the ELs (as R). The ELs wanted to know more about the developments surrounding the preferred alternative and the ensemble proposals (N). They openly shared information, suggesting high mutual trust (T), which is plausible since the CMs and ELs had been working together for a long time. Since November 2017, the trust of the ELs had grown also in the alliance, as from that moment the alliance took the input of the ELs into consideration in their approach. As a result, the ELs trusted the consultant, being part of the alliance. In addition, the knowledge shared by the consultant fitted the ELs'need. At one point in the meeting, the CM2 questioned the promise of CM1 with respect to a meeting to inform the residents on the construction phase; his (non) verbal behaviour suggest a lack of professional trust between the two context managers.

While discussing the actions of the previous ELs meeting, we saw several failure mechanisms occur. First, the *dissipation* failure mechanism, as the ELs had forgotten that they promised to give suggestions for locations where ribbon development use to be and where they wanted this to return. We also saw the *no-relay* failure mechanism, as the ELs experienced that they could not execute this specific action because of the absence of a mandate or support. One EL also forgot to organise a sustainability meeting, suggesting again the *dissipation* failure mechanism.

In previous meetings, the CMs and ELs talked about the inclusion of innovations, and as the ELs asked this question again, we infer that the uptake failed at least partially. The ELs did not seem to have a clear idea of where and when the alliance would start incorporating innovations in the design of the dike, but only referred to the concept of innovations. Based on the FODIKI framework, we were unable to trace back whether the ELs were not open to the message when innovations will be included (fitting knowledge, part of the preconditions) or whether a *cognitive* barrier and/or failure mechanism occurred as their perceptions did not match the shared knowledge.

We saw a *cognitive* barrier occur when the consultant said that some residents would come out of the dike reinforcement in pretty bad shape. He meant to say that some residents are heavily affected by the dike reinforcement. The term 'nastily did not match the jargon of the ELs, and they were visibly shocked, when the consultant used it while discussing the residential enjoyment component. The consultant sometimes formulated unfortunate, but his message did fit the need of the ELs, resulting in a high uptake.

We also saw a *psychological* barrier occur when the CMs explained that the alliance made much effort to include dike relocation in the preferred alternative in the industrial park area, but one EL did not seem to believe this, as he continued to focus on other proposed ideas in this area.

The knowledge transfer around the design process at another ensemble, as described above, had reached the level of *effort*, since the ELs indicated that they could explain it to fellow residents.

Based on this diagnosis, the researcher formulated several points for attention and highlighted these to the context managers:

1. The alliance should carefully consider the expectations of the residents when they want to involve the residents in the design process and the decisions concerning the preferred alternative. If the alliance is to organise a meeting around the construction phase, they should make sure that the purpose and design are clear for all participants.
2. When the alliance designs for the next steps, be alert as to how the element of residential enjoyment will be put on the agenda in the various arenas, especially to the ELs.
3. Although the ELs have expressed their confidence in the process several times, do continue to pay attention to this, as trust takes a long time to build up but can be gone in a second.
4. When dealing with the theme of residential enjoyment, be careful what words are used, because this is a very personal and sensitive subject.

3. AMG-meeting

Context: The AMG (I_{109}) took place one week after the ELs meeting. Where possible, the context managers incorporated the suggestions of the researcher in the script. The alliance wanted to learn in this meeting whether the AMG members had additional points for attention. Here too, the alliance sent the progress report on the ensemble proposals as meeting documents.

Observations: Directly after the start of the meeting, an AMG member asks what the agenda of the EMG is, since they agreed that this will be discussed during this meeting. The chairman agrees and adds this topic at the end of the agenda. After discussing the minutes of the previous meeting, two alliance representatives start their presentation on the taken steps towards the preferred alternative. The first presenter tells that they considered the reactions received during the previous meetings of the SBG-AMG-EMG. He says that the concerns for the enormous impact of the dike reconstruction – some called the dike a 'light version of a sea dike' – have been addressed and made more explicit. He will show on two levels, (1) the dike in the landscape and (2) the dike profile, how the alliance dealt with these concerns. The second presenter then explains the concept of residential enjoyment. During this presentation, the presenter sometimes stops, as if he is searching for the right words. He shows the process by which the alliance will take residential enjoyment into account when designing, and indicates that this is already taking place in the existing processes. The AMG members react positively to the involvement of a sociologist and also to the term 'residential enjoyment', which, as they say, fits in well with the experiences of the residents.

After this, the first presenter takes over and talks about the progress in the recent developments on the mentioned two levels: the dike in the landscape and the dike profile. He tells that they used the vision of the Province of Gelderland for the dike in the landscape. This vision distinguishes three levels, in which three themes recur: housing, hospitable dike (where the dike is more than just a barrier, but also a tribune; in Dutch: *gastvrije dijken*), and river park (the layout of the floodplains). The presenter emphasizes

that several arrangements need to be made with municipalities and provinces concerning the reconstruction of buildings. He shares their first findings concerning the preferred alternative (VKA), but explicitly asks not to share this, as not all residents whose properties will be affected have been informed yet. He stresses the alliance's desire to first talk to the affected residents before the information is widely shared. He also outlines the search for the VKA, given the previously established criteria and the assessment framework. In the development of the VKA, as he explains, they found a reasonable mix of inward and outward reinforcement in soil and they opted for several dike sections, and for structures such as sheet piling. Within the dike sections, further optimisation will be possible in the next project phases to further reduce the impact on the houses. These three options (inward & outward reinforcement and constructions) can be visualized with a triangle. The ultimate mix of options should be somewhere within this triangle. At the end of his presentation, the presenter shows the triangle with a dot near its center, indicating where the alliance expects to end up. The AMG members ask questions to be able to better understand the meaning of the triangle, after which the presenter further explains the triangle.

Next, the AMG members discuss the topics river compensation (the water level in the river should not be increased by the dike reinforcement) and nature compensation (loss of nature should be compensated). The presenter explains the concepts quickly and briefly, prompting in clarifying questions from the RWS representative. Regarding the compensation in the floodplains, the second presenter says that cooperation is required from the partners, but that it is still unclear what type of arrangements exactly will be required from the partners. They start a discussion about what is needed. Rijkswaterstaat also says that they want to be informed in advance.

One AMG member states that the various dike reinforcement projects of the RWA use different terms and concepts, which makes it difficult for him to properly understand everything. Therefore, he keeps asking what the alliance understands by certain concepts. The presenter says that he appreciates that the AMG members ask additional questions. The presenter continues his presentation by explaining that the river landscape will be preserved, and that they want to maintain the course of the current dike where possible. The AMG members ask in what way the residents are informed, and express that, when it comes to re-building, they want to join the kitchen table discussions. The chairman also explicitly asks if the alliance pays enough attention to the local business, in addition to the residents, and suggests that it would be good to discuss this point during the next EMG. After the presentations, the AMG members indicate that the approach for the dike reinforcement may not have changed since last time, but that the overall story is much more nuanced and thoughtful because the alliance shows more emphatically how the different interests are considered and where the synergy with other policy domains lies.

The alliance wants to propose to the EMG to join forces to develop an integrated plan for three floodplains, to deal with the topic of river compensation. Currently RWS is already involved in this process. The AMG members agree with this proposal. One AMG member says that when the GoWA project succeeds in carrying out such compensation within its project boundaries, it will be an example for others, as until now the compensation is found somewhere else. The AMG recommends that a fact sheet be drawn up for each area, so that it becomes clearer for the EMG what the alliance asks. They say that they

sometimes feel that the project is either running fast or standing still. As AMG member, they would like to know earlier when what is expected of them. They also advise to outline the follow-up process, so that the executives also know that certain subjects will be discussed in the subsequent steps.

In their progress report, the alliance proposed to drop two ensemble proposals, namely the 'rubble back' at Herwijnense Waard, as the residents call the location where several meters of construction debris lies in the flood plain, and Tuils harbour, because they found no one to adopt these plans. The AMG members agree. One AMG member proposes that all proposals should be reviewed and briefly discussed in the next EMG meeting. He stresses that the EMG members need to get an overview of what will and what will not be realized.

Before the closure of the meeting, one AMG member asks how the SBG has reacted on the presentation. The chairman responds that the SBG meeting will take place the following day. The AMG member stresses that the advice of the SBG was very nuanced the last time, and he compliments the SBG, for how they fulfil their role.

Interpretation, diagnosis & interventions: In this meeting the alliance representatives acted as sender (S) of the project progress (K). The AMG members (as R) wanted to know what the recent developments were and if and when a contribution was expected from them (N). They were also seeking for information such that they could inform their executives, prior to the EMG meeting. The preconditions for knowledge transfer and uptake appeared to be met: knowledge sent by the AMG members and the alliance representatives was trusted on the basis of their public office, and the belief that they perform this office following rigorous procedures. In addition, they have been working together for a longer period of time, making it plausible that the trust (T) precondition is met.

At the start of the meeting, a *transmission* barrier arose as the EMG's agenda did not seem to have been sent along with the meeting. This was frequently discussed at an earlier meeting (cf. chapter 4, thread V). As the project team promised that the EMG's agenda would always be on the AMG's agenda, this suggests a *dissipation* failure mechanism. Compared to the previous meeting, the alliance paid attention to a specific part of the assessment framework: residential enjoyment. The AMG members were pleased with this focus but asked clarifying questions, suggesting *cognitive* barriers. During the presentation on residential enjoyment, the presenter sometimes stopped, as if he was looking for the appropriate wording, which made his story somewhat hesitant. We interpret this as a *transmission* barrier.

After explaining the potential solution for strengthening the dike, the presenter showed a triangle with a dot in it, to indicate how they expected that the preferred alternative would strike the balance between inward, outward dike reconstruction and the use of constructions. The AMG members were at first confused about the meaning of this visualisation, but thanks to their comments, the alliance representative explained it, preventing a *cognitive* barrier from occurring.

In the meeting, confusion also arose around river compensation and nature compensation, which could lead to a *cognitive* barrier. Here too, one AMG member gave feedback, after

which the alliance presentative explained the concepts in more detail, preventing again a *cognitive* barrier. The researcher also asked afterwards whether these predominantly 'technical' concepts were sufficiently clear to the other participants.

After the meeting, the researcher intervened by making the following suggestions:

1. As the alliance wants the EMG to cooperate in the development of an integral plan for three floodplains to be able to meet the requirements for river compensation and nature compensation, the alliance should be clear in what they ask of the other project partners.
2. In preparation for the SBG meeting, the visualization of the triangle should be changed. Usually participants remember a visualization, and the SBG members might think that the alliance, having said that many constructions were possible, with limited additional costs, in the previous meetings, had come to a different conclusion, possibly leading to a *no-relay* failure mechanism. The alliance should only show the triangle without the red dot to the SBG members, as the alliance representative can then indicate the location using his finger.
3. As the AMG members complained during the meeting that they sometimes must wait and that then suddenly must hurry to review a product, the alliance should have a transparent planning to create a need earlier by indicating better when what will be asked of the other authorities.

Intermezzo: In the reflection meetings ($I_{110\text{-}111}$) after the AMG meeting, the alliance employees also looked ahead to the next meeting, and again expressed their concerns about the confidentiality of the information in the presentation and asked the researcher for advice. The researcher intervened by making the following suggestions for the SBG meeting:

1. Emphasize the role of the SB at the start of the SBG meeting: each SBG members represents an interest organization, and hence they represent the general interests and not an individual interest. The role of the SBG has been formulated with the SBG members in one of the first SBG meetings, and since then has not been addressed again. In the preceding SBG meetings, SBG members asked others to do the honours. To make everyone again aware of the role of the SBG, it seems legitimate to restate its role again.
2. Move the agenda item 'Communication plan', before the agenda item 'Preparation for VKA'. For the 'Communication plan' item, the alliance can clearly indicate how it wants to communicate with the residents, and how important the alliance considers it to be that the affected residents are informed first.
3. Emphasize at the start of agenda item 'Preparation for VKA' that the presentation contains sensitive information, and ask the SBG members not to disseminate this information further. By setting the agenda and asking for trust, the alliance and the SBG reaffirm the goals of openness and transparency.

4. SBG-meeting

Context: The SBG had to develop an advice to the EMG on the topic: 'Preparation for the preferred alternative' and the 'Progress of the ensemble proposals'. Based on the

interventions proposed by the researcher, the PT held a preparatory meeting with the SBG chairman to discuss these changes. Aim of the PT was to learn how the SBG felt that the alliance had dealt with the concerns of the last meeting (I_{101}), and whether the SBG members had confidence in the taken steps towards the preferred alternative. Prior to this SBG meeting (I_{113}), the CMs sent the Communication plan and the progress report of the ensemble proposals as meeting documents to the SBG members.

Observations: At the start of the meeting, one SBG member compliments the alliance on the clear newsletter. The chairman then continues, stating that the Communication agenda item is moved before the 'Preparation for VKA, as this gives already insight in the planned steps. He draws attention to the role of the SBG and that the members are asked to respond from their general interests. The chairman asks 'not to share information that you receive during the SBG meetings. The alliance regularly shares work in progress, and changes can be made afterwards. We want to prevent misunderstanding in the community based on the presented preliminary results'. One SBG member is triggered by this remark and asks if things have gone wrong, and whether information has leaked. The chairman reassures the SBG member by saying that this is not the case, and that he merely thought it wise to recall them because that was last discussed a long time ago. He also sees this as a precaution to prevent things from leaking, especially because in the coming weeks people will be personally informed by the alliance. He adds that he sees a few new faces around the table and that particular for them, it is good to repeat the basics. Next, a presenter explains the Communication plan, as it highlights the basic idea how the alliance wants to communicate. 'We realise that it can sometimes be difficult. We are all people, we can't always provide clarity if we ourselves do not know every detail yet. We are now navigating between the old and the new situation. The guiding principle we follow is to involve and inform the residents. In the initial phase we had a railway timetable, which formulated all the moments. In the process of designing, however, we cannot look so far ahead. We must keep recalibrating it. That is why we have made the participation and communication calendar, distinguishing between these levels: (1) everyone who wants to know something about the projects, (2) project stakeholders, per dike section, and (3) individual (affected) people. We want to personally inform anyone who is really affected by this project'. He asks whether the basic idea is clear, and indicates that there is a difference between the kitchen table discussions, with a focus on the individual interest, and the walk-in meetings, with a focus on the collective interest. The SBG members suggest that the alliance should not take too much time between the kitchen table discussions and the walk-in meetings, because news spreads quickly, possibly resulting in false stories. During the discussion, an alliance member asks if the SBG members know who can change the preferred alternative in the future. One SBG members tells that only collective interests can change the VKA, and not individual interests, after which the alliance member agrees. The SBG members explicitly ask how the kitchen table discussions are conducted. They express concerns that only one solution is presented to the residents, whereas several variants may differ not that much from each other. Some SBG members stress that 'it is important for the residents and the alliance to jointly discuss the potential solutions'.

After this, the consultant on residential enjoyment tells about the progress and meaning of this theme for the project, which can be something quite personal. 'It goes beyond having a roof over your head. Currently, we are still looking at dike level, and it is difficult.

We have not done new research, but based our study on what people have said, on the views received on the *NRD*, the walk-in meetings and the ensembles. In later project phases, the relevant houses will be examined in more detail with respect to this theme'. Some SBG members ask questions about the possible depreciation of the houses, but the consultant replies that he has not looked at this. One SBG member indicates that it might be possible to couple the monitoring of the residential enjoyment with the ensembles. An alliance member responds to this: 'the monitoring at process level, I think, is more a role for the SBG, and as the project progresses, it becomes more and more individual'. The SBG member responds that 'the RWA has always said that the ensembles would be there till the end of the construction phase. I can imagine that the SBG will play less of a role once the decisions are taken'.

After this, the original agenda of the meeting is followed. In the section 'Preparation for the VKA', the alliance representative indicates that what the SBG members get to see today is the current state of affairs, but that this can still change in certain respects, partly because of new insights. He explains that the alliance is investigating three alternatives, and that they are currently assessing the effects. He explains that 'within the search area, we look for an optimal result per dike section. After that we string everything together, which can result in changes'. He stresses, that 'it is emphatically not a choice between the alternatives, but a choice based on argumentation to arrive at a preferred alternative'. In his presentation, the alliance representative at a certain point uses the word 'reconstruction right', upon which an alliance member asks whether this term is not too absolute, and how the SBG members define this term. The perceptions evoked by this term show that they should consider using a different term, because otherwise the residents will expect something that cannot be delivered. For some terms, clarifying questions are asked, and all participants listen with concentration and attention, and participate in a constructive way.

The alliance representative continues explaining that when the dike is strengthened towards the river, river and nature compensation must also take place. He tells that the alliance will request the EMG to agree to and cooperate on an integral plan for three floodplains. An SBG member asks what Rijkswaterstaat's attitude is about the outward dike reinforcement, as the SBG members are visibly surprised when the presenter shows that the alliance is 'going outside at various places along the dike. A context manager explains that Rijkswaterstaat constructively thinks along and that they continue to discuss the possible risks.

At the start of the agenda item 'Progress report on proposals for ensembles' the chairman says that this was thoroughly discussed with the ELs during the last meeting, and asks if there are any additional comments at the time. A context manager explains that in the progress report, most proposals have the colour green as indicator for the progress. He explains that these proposals are going according to plan. 'We can assess whether they can be fitted in with the VKA or whether additional effort is required'. The context managers focus on two specific proposals for which the alliance could not find anyone to adopt this idea (Tuils harbour and the 'rubble back' at Herwijnense Waard), and ask the permission of the SBG to withdraw these proposals.The SBG members agree and request the EMG to make good speed with the remaining proposals. After this, the chairman closes the meeting.

Interpretation, diagnosis and interventions: Similar to the preceding AMG meeting, the alliance (S) was the sender of knowledge about the project progress (K). The need of the SBG members was to learn about the progress in the preferred alternative and the undertaken steps in the ensemble proposals (N). Over time, the participants had learned to trust each other, and also during this meeting they openly shared their knowledge, so apparently the preconditions for knowledge transfer and uptake were satisfied.

During the meeting, the participants developed an adapted lexicon with each other; concepts such as 'residential enjoyment' and the 'reconstruction right' were initially interpreted differently by the participants, which made it necessary either to change the name or to sharpen the definition together. Initially, this created *cognitive* barriers, but these were mitigated during the meeting, because the alliance employee asked for clarification at the right moment, even before the researcher could signal this to him.

At the start of the meeting, one SBG member was triggered when the chairman emphasized the role of the SBG again. For a moment he thought, as he said in this meeting, that an SBG member might have leaked information, and that the chairman was rebuking this. The SBG member had participated in many sounding board groups in the past decades and never was information leaked by one of the members. He felt that this was impossible, and therefore he could not accept the message to be true which suggests the occurrence of a *psychological* barrier.

The interventions proposed in advance were incorporated in this interaction moment, so that the participants listened to the presentations with the right mindset. The SBG's advice was more positive about the course of events than last time: for example, the pejorative term 'a light version of the sea dike' was no longer used. The SBG members were particularly concerned how the alliance would inform the residents who were affected.

Based on this diagnosis, the researcher formulated several points of attention:

1. The alliance should regularly ask comments and advice on the used concepts to prevent misunderstanding.
2. The CMs should further clarify the definition of affected houses, as this concept did not seem clear to everyone, which in the future could lead to further misunderstanding and possibly in a loss of trust by the participants in the alliance.
3. In line with the previous point, the time frame of when the alliance will sit around the table with residents is also important. During the SBG meeting, the CMs were unable to give a specific time frame, other than the summer period. The suggestion is to further clarify when the alliance will have these kitchen table meetings to inform the residents and when the information meetings are organised.

5. Trilateral meeting to prepare for EMG meeting

Context: Following an earlier consultation (I_{103}), the alliance manager, a context manager and the researcher held a trilateral meeting (I_{112}) to prepare the EMG ($_{I114}$). In the previous EMG meeting (I_{95}), there was resistance to the RWA's wish to move forward with the preferred alternative. Some executives felt that more attention should be paid to the preservation of homes and the authenticity of the river landscape.

Observations: The context manager first reflects on the AMG meeting of the day before, and the researcher shares some observations. The researcher reflects that there were two presentations: one informed the AMG members which steps the alliance had taken for the preferred alternative, and the other one focussed on residential enjoyment. The context manager explains that both subjects were discussed to see whether the Graaf Reinald Alliance had taken up the gauntlet (see also thread VIII, chapter 4) sufficiently, given the concerns of the AMG members in the previous meeting. The researcher states that she feels that most of the AMG members agree and concur with the steps taken, but some members still have additional questions. For example, the river compensation is important to Rijkswaterstaat, so they want to become more involved. The alliance manager and context manager state that they want to gain the cooperation of the EMG members to develop integral plans for three flood plains. The researcher tells that the EMG members want to know what kind of cooperation is requested. In their discussion, they agree that the alliance wants the administrators of the governments to actively participate in developing the integral plans, and they expect the governments to help facilitate the necessary legal procedures.

The researcher also recalls that in the previous AMG meeting, the AMG members had strong opinions on the preservation of houses and the authenticity of the river landscape. She remarks that in yesterday's meeting an AMG member asked for a story line that shows by what reasoning the alliance came to their changed approach towards the preferred alternative. In yesterday's presentation, the alliance representative explained that they, as alliance, adapted the Provincial vision on the Waal to accommodate the ideas of the GoWa project. The researcher suggests that the alliance representative more clearly explains the main points of the Provincial vision. He could also stress that Provincial colleagues have participated in the translation of the vision to the GoWa project. The context manager agrees that his colleague should refine the introduction of the presentation based on their experiences.

Together they also reflect on the comment of one AMG member as to 'whether the previous EMG had been necessary', as several EMG members had strong emotions on the presented work-in-progress to come towards a preferred alternative. The AMG member now stressed that he better understood the followed approach. The alliance manager replied that, in retrospect, 'it turned out to be an ideal intervention, because the aim of the previous meeting was to obtain a prioritisation of the executives. Knowing that they would never give that, we just wanted to prick and push to hear what was important. Well, we succeeded. And now the EMG members ask us what we have done with their concerns. It is good as it happened. In retrospect, we – as alliance – could have better prepared that meeting to smoothen the need of the EMG members. We wanted to show to the local councils that the RWA is in control and that the others should not disrupt the process that has been started, but the way we introduced that was not helpful in maintaining their confidence in our approach'. The researcher suggests that the alliance could be more helpful towards the other EMG members by framing the project in such a way that every executive can celebrate a success around the dike reinforcement project, especially seen in the light of the upcoming elections.

The researcher also suggests to thoroughly prepare the meeting with the EMG chairman. She advises to ask the question what he needs, and advise him that he should consider

'picking your battle wisely' in the EMG meetings. She stresses that the alliance in this preparatory meeting should inform the EMG chairman what they wish to achieve with the next EMG meeting, after which the EMG chairman can focus on before and during the EMG meeting. As two EMG members had strong reservations during the previous meeting, the researcher suggests to the alliance manager to talk to both directly after the meeting, to learn whether they are sufficiently satisfied with the steps taken. The alliance manager agrees with this suggestion.

Under the EMG agenda item 'progress of ensemble proposals', the researcher proposes to show, possibly with a table, on which ensemble proposals can and cannot be realised (and for what reasons) or what is still unknown, as this insight is currently lacking. Considering that some EMG members have highlighted the importance of expectation management around the realization of the ensemble proposals (thread VI, chapter 4), discussing this first in the EMG will help gain support from the EMG for this approach. After this, the alliance could also provide more clarity to the residents and ensembles. Finally, the researcher says that the agenda item 'Minutes of the preceding meeting' took relatively a long time, leaving less time for the substantive points. Therefore, the researcher suggests that this agenda item should be placed last on the agenda, rather than at the beginning. Both the alliance manager and context manager welcome these practical suggestions.

Interpretation, diagnosis and interventions: The preconditions were met. The alliance manager and context manager acted both as sender and receiver. The need (N) of the alliance manager and context manager was to know whether their approach fits well with the needs of the EMG members. The researcher was particularly interested in whether the proposed interventions contribute to improving knowledge transfer and uptake. Over the past 2,5 years, a good relationship of trust (T) had been built up between the two parties as they openly shared knowledge. Knowledge sent by both parties was also trusted on the basis of past performance and reputation.

During the consultation itself no barriers or failure mechanisms occurred. The uptake of the knowledge transferred reached the level of *effort*, because the alliance manager and context manager actively tried to incorporate the shared knowledge in the script for the subsequent EMG meeting. This will become apparent in the next subsection.

6. EMG-meeting

Context: During the previous EMG meeting (I_{102}, cf. chapter 4, thread VIII), the EMG members criticised the approach of the alliance, and requested another approach. At the end of that meeting, the alliance manager promised to provide more clarity about the process to be followed towards the preferred alternative. Following this meeting, the alliance had several consultations with individual EMG member, AMG members and ELs. In this EMG meeting (I_{114}), a new representative of a municipality participates, having come into office after the recent municipal elections. Prior to this meeting, the alliance sent the agenda, with these meeting documents to the EMG members: the minutes of the preceding meeting, the progress report of ensemble proposals, a memo for developing an integral plan for river and nature compensation, and the minutes of the SBG meeting (I_{113}).

Observations: The chairman opens the meeting by announcing that this meeting had been scheduled because of the remarks made last time. He also announces that he has been informed that the DFPP Programme Management will no longer attend these meetings. An EMG member objects that he understands the developments, but at the same time feels that Rijkswaterstaat should have a more prominent role in the EMG meetings. Other EMG members express their concerns about the project-crossing issues, such as river and nature compensation, that will be implemented in this project, which may set a precedent for the RWA and DFPP. The chairman nods and says he will contact the DFPP. After that, he welcomes the new municipal delegate. After a short introduction round, the chairman moves to the next agenda item, asking whether the alliance manager wants to give an introduction, and whether he still has 'stomach ache', as he expressed that he had during the previous meeting (cf. chapter 4, thread VIII). The alliance manager responds that last time the alliance came to realize how big the impact of the dike reconstruction was and that this gave him a stomach ache. The alliance manager outlines what happened in the previous meetings and says he is happy with all the comments received from the SBG, AMG and EMG. This has helped the alliance to sharpen and enrich the follow-up steps, not only specifically for this project but also for the RWA. He then summarizes the taken steps. The newcomer in this meeting asks all kinds of clarifying questions about concepts like new norms and dike failure mechanisms, and about the meaning of abbreviations, as he is new to the world of dikes.

Two EMG members immediately react to the concept of residential enjoyment, based on the document sent with the agenda. In the discussion that follows, they are confused how the preferred alternative is developed. The alliance members explain that for each dike section, the most promising solution is examined: strengthening inward in soil, strengthening outward in soil, and the use of structures, which was shown as a triangle. Several EMG members feel that the component of residential enjoyment should be a fourth dimension. One EMG member reacts that the triangle is correct, but that the residential enjoyment is in the weighing framework and is now being weighed more heavily than before. The alliance manager agrees with this EMG member. After this, the alliance representative begins his presentation around the preparation for the preferred alternative. Another EMG member indicates that he does not know the status of the 'spatial planning table' (a new institution for dialogue between the governments about how the legal procedures can be streamlined for the GoWa project), nor how the governance around it is organised, as this was mentioned in one of the documents. The context manager reacts that this is yet to be organized, but that the tracks are currently running in parallel. The EMG member emphasises that he wants to be involved in his pure role as the competent authority and not as an interested party. He also emphasises that his AMG representative tries to inform his colleagues, but that his mandate is limited.

When the alliance representative uses the term 'area development' in his presentation, another EMG member responds that the image of area development can be very broad and suggests using the term 'dike vision'. 'This makes it sharper what you are doing'. The presenter agrees and continues by highlighting the three levels in the province's area vision in relation to the dike vision. An EMG member says that he finds this 'reassuring in terms of cooperation'. He also argues that nothing new should be invented, as the current values should be safeguarded where possible. He then says that he has heard of the plans to relocate a company, and strongly advises that his fellow delegate

plays a role in this process. Another EMG member explicitly states that he wants to be involved in the concept of 'hospitable dikes', and wants to think along with the floodplain management team about the compensation areas for both river and nature compensation. Rijkswaterstaat stresses that for the floodplains they want to act as a host, not a lifeguard. The alliance emphasises that there are opportunities for synergy, but that now is the time for administrative and planning cooperation.

One EMG member is explicitly asking questions about the progress around the *Hollandsche Waterlinie*, becoming a World Heritage, partly in response to recent reports about the peat colonies in the Province of Drenthe, as this World Heritage application is still pending. He stresses that for the Netherlands it is important that the *Hollandsche Waterlinie* becomes part of the World Heritage, and this application involves a rigorous procedure. He wants to learn more about the necessary HIA (Heritage Impact Assessment) and how the HIA may help in determining the possibilities for the preferred alternative. In their response, the alliance reassures this EMG member how the project uses the HIA, so as to not endanger the application for the World Heritage. In the discussion, the role of the involved municipalities is also made clear.

Two EMG members then express their concerns about communication with the residents, partly inspired by the SBG's minutes they received as meeting documents. They want to know what the alliance tells the residents in this stage of the project. The alliance manager tries to explain, but the EMG members keep asking clarifying questions. At a certain point, the SBG chairman explains that the SBG members understand that this is now a *draft* preferred alternative, and that several issues are simply unknown at this stage. The RWA's dike strengthening programme team manager then outlines the funnelling process to arrive at a preferred alternative, and also indicates at what moment the preferred alternative concept can be widely shared. The executives are satisfied with this explanation. The EMG members also agree that false stories or rumours cannot be completely prevented, but that the alliance will handle this with care.

At some point during the meeting, the alliance representative tells more about the homes that will possibly be demolished. An EMG member asks whether jacking up buildings is an option, and says that he spoke a woman who said that the project team of TiWa (the dike strengthening project adjacent to GoWa) told that jacking up was no longer an option for the RWA. The RWA's dike strengthening programme team manager responds that the opinions differ within the RWA, but that the RWA is still considering this option in the RWA's projects.

The alliance representative then continues his story about the compensation possibilities. He says that the alliance considers three locations for both river and nature compensation: Woelse Waard, Herwijnense Bovenwaard and Crobse Waard. These areas may have extra margins for other projects, but it is important for the RWA to communicate this clearly. The chairman asks whether the path the alliance has taken regarding compensation is the right one. An executive responds that seems the appropriate path, but asks about the costs. 'After all, I see the costs for the dike reinforcement rising and with that the need to temper the expectations of the stakeholders of what can be realised'. The chairman pleads for synergy to be created in the joint effort of the involved governments. At some point the chairman says that 'we all should realize that for certain plans extra financial

resources might be needed'. This prompts a question from an EMG member, regarding the finances and the DFPP subsidy scheme. The other executives respond that that they do not want to end up in a dead lock situation and ask for a careful process.

One EMG member regrets that he must leave early, but indicates that he is happy with what he sees now, and that the SBG's concerns have been allayed. He now sees a much more nuanced picture than last time, and asks whether the video, that was shown during the previous EMG meeting has been destroyed. The alliance manager responds that the signal is clear.

Finally, the alliance representative explains how the dike will be integrated into its surroundings and that the RWA will apply a 'living layer' in such a way that use of the verges up to the management strip will be possible, just as it is today. This will make the spatial appearance of the dike considerably less massive. The chairman gives the example of the dike reinforcement at Hagestein Opheusden where a horticulturist started an orchard on this 'living layer'. An EMG member explicitly asks what would happen to two – now still blank – locations in Haaften. The response is that the industrial park still has five possible variants and that, at another location, the choice for the preferred alternative is dependent on the requirements for Natura 2000. The SBG chairman emphasises that the SBG was pleased with the steps taken by the alliance, and requests that this remark be explicitly included in the minutes of this EMG meeting.

The next item on the agenda is skipped because a great deal was already discussed during and prior to the presentation on the residential enjoyment. With respect to the agenda item on 'possibilities for river-related compensation', the chairman explicitly asks whether the executives are willing to cooperate in the administrative and planning elaboration. One EMG member responds that 'it would be a shame if we said no'. Under the agenda item 'Progress report on development proposals for ensembles', the EMG agree to no longer consider the proposals 'Tuils harbour' and 'rubble back' at Herwijnense Waard. One EMG member asks for good communication with these two ensembles. Another EMG member emphasises that he wants to participate in the discussion on two specific locations, namely 'Heufterrein' in Vuren, and Haaften. Finally, the minutes of the previous EMG meeting are checked and approved. At the end of the meeting, the SBG chairman asks to spread the word on this project and its innovative approach. The EMG chairman indicates that this has his attention. The newcomer to this meeting compliments all participants. 'I am leaving satisfied'.

Interpretation, diagnosis and interventions: Once again, the alliance representatives were the sender (S) of the project progress (K). The EMG members (as R) commented on the presentation of the alliance. In addition, content knowledge was shared on the choices made based on the previously established assessment framework. The EMG members wanted to know whether the remark of the previous meeting had been sufficiently considered and how the preferred alternative would take shape (N). The precondition of trust (T) was satisfied based on several reasons: knowledge sent by the EMG members and alliance representatives was trusted on the basis of their public office, and the belief that they perform this office following rigorous procedures. However, these rigorous procedures were questioned during the previous EMG meeting, which led to loss of trust of the EMG members in the alliance and RWA. We assume that the preconditions for knowledge transfer and uptake were satisfied.

The newcomer had an information deficit which became visible through his clarifying questions to overcome *transmission* barriers and *cognitive* barriers. Through feedback and explanatory questions these barriers were mitigated by the chairman and the alliance manager. A *cognitive* barrier arose when the EMG members talked about the choice how to strengthen the dike. A few EMG members thought that residential enjoyment had been added as an extra dimension, while it had only been given a heavier weighting in the weighting framework. These different perspectives on the weighting framework led to different frames of references and thus in a semantic distortion. One EMG member and the alliance representatives explained the role of residential enjoyment in more detail to mitigate this barrier. During the EMG meeting four failure mechanisms threatened to occur, namely:

1. A *resources - restrictions* failure mechanism threatened to occur when the chairman indicated that possible extra financial resources were needed for synergy projects for river and nature compensation. Especially as inn earlier meetings, some executives had indicated that no additional resources were available for this dike strengthening project.
2. The other executives indicated that the requires for extra financial resources might lead to a deadlock situation, as they might want to act only in their own interest, which we see as a potential '*strategic power play*' failure mechanism.
3. The *institutional restrictions* failure mechanism might occur if the status of the 'spatial planning table' and the coordination with the competent authorities were not sufficiently thought out in the next months. One EMG member clearly indicated he wanted to be involved in his pure role as competent authority and not as merely an interested party.
4. The *diffidence* failure mechanism might occur around the possibilities of jacking up buildings, as many different images existed about the added value of this technique within the RWA. Within the RWA some professionals saw the added value of this technique, whereas others only saw the negative aspects, as experienced in a dike strengthening project.

The uptake of the knowledge that had been shared in the previous EMG meeting development of the preferred alternative, and the change in approach reached the level of *reference* in this meeting, as EMG members referred to this knowledge The uptake of the prioritisation by the executives around the weighing framework reached the level of *effort*, as the alliance changed elements in the approach, among others by making residential enjoyment more explicit.
Based on her observations and diagnosis, the researcher afterwards made these suggestions to the context manager and alliance manager:

1. During the meetings, two EMG members advocated a stronger commitment of their organisations to the project. They see various reasons for this, some of which affect their interests, tasks and responsibilities. The alliance should have more bilateral meetings with both the administrators and executives. Through the bilateral meetings, the alliance can share relevant information and keep them updated in-between the AMG and EMG meetings.
2. A new face at the table brings a new dynamic. Considering that many municipalities are merging into a new municipality West-Betuwe, and also considering the upcoming

Provincial and RWA elections, many more new faces can be expected. It would seem wise to prepare a 'standard' information package with the most important concepts concerning dike reinforcement, and hand this to all new entrants in the process. This intervention, transcends GoWa, also applies to the RWA in general sense.

3. The dike redesign process is sometimes – for the outside observer – a diffuse process. This requires that stakeholders are properly involved and informed in the various steps. In addition, several dike reinforcement projects are currently underway within the RWA and along the river Waal. The stakeholders experience that the projects have different approaches and sometimes use the same concepts differently. The RWA project teams should share their approaches regularly and use, where possible, similar concepts and definitions.
4. For each meeting, the process manager should consider the needs of the receivers. In this EMG meeting, the EMG members warned the alliance that they did not want to be trapped in a deadlock regarding the finances, suggesting that failure mechanisms occurred. Therefore, the alliance should be vigilant the possible identified failure mechanisms, particularly the 'strategic power play', where a receiver perceives the knowledge as unwelcome, prohibiting a knowledge uptake level above *effort*. To mitigate this, a knowledge broker operating on behalf of the alliance in multiple arenas could help to ensure that the shared knowledge is brought forward.
5. For the follow-up process, the alliance should develop a well-thought-out timetable indicating when what is requested from the project partners, in such a way that they have sufficient time to react. All involved portfolio holders and decision-making bodies should then reserve time that they can carefully prepare the meetings.
6. For the next meeting, it is good to coordinate how the position of DFPP in the administrative process is safeguarded. The alliance should discuss this with the DFPP, as both Rijkswaterstaat and RWAs are part of the alliance of the DFPP.
7. Prior this meeting, the draft minutes of the SBG were circulated. Several executives posed questions in response to the SBG minutes, even before the SBG chairman had given his summary of the meeting. More questions were raised later in the presentation by the alliance representative. The alliance should only share SBG minutes, that have been approved and checked by the SBG members. In addition, the SBG chairman should also give first his summary of meetings, as the minutes can be misunderstood, which could negatively affect the preconditions for knowledge transfer and uptake.

These proposed interventions were discussed with the context manager and alliance manager, and formed the input for the next round of meetings (I_{137}, $I_{139\text{-}143}$). Most suggestions reached the uptake level of *effort*. A similar set of meetings, interim meetings and interventions took place, as described in this thread, to ensure that the knowledge was successfully transferred in such a way that eventually the competent authority of the RWA could determine the preferred alternative in October 2018.

5.4 Reflection and preliminary conclusions on intervention (in real time) in a 'live' case

The aim of this chapter was to investigate whether interventions were possible to improve knowledge transfer and uptake, and whether the chosen interventions were effective. We saw in ten threads that purposeful intervention firstly requires observation and analysis. To improve knowledge transfer and uptake, we can then propose interventions based on the FODIKI framework that secure the preconditions, remove barriers, and mitigate failure mechanisms. Building on De Bruijn *et al.* (2010) we group interventions in three categories: (1) knowledge management interventions, (2) process management interventions, and (3) policy network interventions. Each type of intervention can enhance the knowledge transfer and uptake.

Knowledge management interventions

This category focuses on the removal of barriers that occur during meetings. For the three types of barrier identified in section 2.3, partly different and partly similar interventions can be made.

For the *transmission* barrier, the intervention possibilities typically include anticipating on failing equipment, reducing exogeneous 'noise', and ensuring that someone having limited communication skills nevertheless presents or reports in a clear way. In thread VII we saw that the technical problems of the laptop made it difficult to follow the project manager's story. The intervention was that the next time two laptops were brought to the meeting (plan for disaster). When preparing for a meeting, the organisers should inquire whether in the same building a brass band would be practicing or volleyball competition would be going on. To cope with limited communication skills, the context manager proposed in thread IV to record the presentations for the board conference in advance. In the same thread, we saw during one of the village consultations that switching back and forth between a map and a report was less effective. The next time this was resolved by making a PowerPoint presentation.

For *cognitive* barriers, the intervention possibilities typically include creating a common language by explaining and jointly defining certain concepts, such that all participants have the same frame of reference. In threads II, IV and VII, ambiguous concepts were used, such as 'artefact' and 'building block', that had different meanings for different groups of stakeholders. This required developing a shared definition. Likewise, in the threads IV, V, IX and X, the project team members repeatedly explained the chosen participatory community engagement approach to create a shared frame of reference. A cognitive barrier also occurs when the receiver lacks prerequisite knowledge; hence the sender should tailor the knowledge to the *a priori* knowledge of the receiver. The receiver's knowledge is not static, but may change during a meeting as receivers gain more knowledge. Sometimes it is also necessary to share additional knowledge, such as the steps to design a dike, enabling the receiver to use earlier transferred knowledge. Interventions aimed at creating a shared language may involve using visualisations, as a picture says more than a thousand words. This happened in thread X around the length of the inner berms of the dike. Time is an important factor in the transfer of knowledge (Goh, 2002); the time that a receiver needs to mentally construct the knowledge varies.

When the receivers lack *a priori* knowledge, sensemaking can be hampered. This suggests that effective knowledge transfer requires allocating more time. The process designer should always be aware that new participants lack knowledge, and design the meeting such that previously shared knowledge is shared again to give everyone the same knowledge base. In the briefing of meetings, the members of the organising committee should be prepared to re-articulate the earlier shared knowledge to stimulate sensemaking (see also thread IX).

The *psychological* barrier that occurs when there is cognitive dissonance and/or an identity conflict, requires more expertise to diagnose and intervene upon. The intervention possibilities typically include: taking the receiver's position and perception as starting point, communicating clear and realistic expectations, and anticipating on cultural differences. In thread II, the ELs continued to see only the benefits when applying innovations, and they were blind for the risk. In thread III, the participants reacted defensively to the chairman's request to further develop the ensemble's vision, and as he kept repeating his approach the SBG chairman intervened by highlighting the that the primary aim of the follow-up steps of the ensembles was to get consent from all stakeholders. In thread VI, the receivers felt that they were not fit for a certain task, and despite their effort to address this, this was not adequately taken up by others. The proposed intervention here was to make clear agreements on the required follow-up and the communication towards all relevant stakeholders. Likewise, in the threads IV, V, IX and X, the project team members repeatedly explained the chosen participatory community engagement approach, emphasizing that this process is new for all participants and that hence old routines and expectations of the process are no longer valid. In the threads IV and VII, stakeholders felt that they could not share their points of view, as receivers found them unrealistic and started to challenge them. Here, the intervention was to establish 'rules of the game' such that everyone was able to share their points of view without others criticizing them. For this, the sender requires knowledge about existing cultural differences, and needs to be alert to signals indicating them.

The threads show that preventing barriers is not simple. We found that each meeting should be thoroughly designed bearing in mind the determinants defined in the FODIKI framework, as the stakeholder configuration is different for each meeting. The needs are – as we mentioned earlier – not static and can change over time. Real-time interventions are not always possible. Exogenous noise cannot always be cancelled during meetings. In projects, people come and go, and storytelling to the newcomers is one intervention possibility to ensure that he/ she has sufficient knowledge background to participate in the process. Trust is largely interpersonal (Rotter, 1967) so continuity in staffing on the lead actor side is necessary; otherwise effective knowledge transfer within group, and time and awareness for *re*building trust are needed. The collective knowledge is situated in a group (see section 2.3), and this means that knowledge on the course of a project, the agreements made, and the precedents set are important to maintain the built-up trust. 'Mentoring and storytelling can leverage the tacit knowledge of an organization and project to build core capabilities' (Swap *et al.*, 2001). Finally, we saw that senders are able to adapt new ways of sharing knowledge within meetings. In the crash course (thread V) we saw a learning effect between the two rounds, meaning that the *a priori* knowledge of the receivers had changed. In the second round of the crash course the TM used different wording as opposed in round 1. The participants in round

2 had already mentally constructed the gained knowledge of round 1, which led them to use the shared concepts heard in the floodplains presentation. The TM responded to the questions while using technical terms that were not in his presentation but were in the floodplains presentation. Their collective knowledge of the group in round 2 was different, meaning that certain propositions (used as intervention) were ineffective, as they already knew the answers. More generally, interventions that work in a setting with certain stakeholders may prove to be ineffective in another setting, even when the observations – diagnosis combination is quite similar.

Process management interventions

This category relates to the process design of meetings. De Bruijn *et al.* (2010) have identified sixteen design principles as listed in table 5.1, grouped into four main principles: (1) openness, (2) protection of core values, (3) progress, and (4) substance.

Table 5.1 Design Principles of Process Design (de Bruijn *et al.*, 2010)

Main principle	**Design principles**
Openness	1. All relevant parties are involved in the decision-making process 2. Substantive choices are transformed into process-type agreements 3. Both process and process management are transparent
Protection of core values	4. The core values of parties are protected 5. Parties commit to the process rather than to the result 6. Parties may postpone their commitments 7. The process has exit rules
Progress	8. Stimulate 'early participation' 9. The process offers stakeholders prospects of profit 10. The process offers stakeholders opportunities for quick wins 11. The process is heavily staffed 12. Conflicts are addressed in the periphery of the process 13. Tolerance towards ambiguity 14. Command and control is used as a catalyst for the process
Substance	15. Substantive insights are used for facilitation; the roles of experts and stakeholders are bundled and unbundled 16. The process proceeds from substantive variety to selection

These design principles help to diagnose the knowledge transfer *and* uptake, *and* can be used to identify possible interventions. We start with diagnosing and ensuring the relevant preconditions, namely trust and willingness to share, as these FODIKI concepts are linked to the first two main principles. We then point out related examples in our diagnosis and proposed interventions in the described threads.

Trust (T) and willingness to share are linked to openness (1-3) and protection of core values (4-7), and smoothen the overall process. To ensure trust, lead actor transparently inform the relevant parties about the progress of a process (1 and 3), and the relevant parties are consulted in most steps of this process. When participants openly shared their knowledge, we assume that there was mutual trust and that the willingness to

share precondition was met. Interventions to ensure the trust, as seen in thread IV, VI and IX, are aimed to involve all relevant stakeholders in the process (1), and to inform and consult them about the planned design process (2). The process manager also tries to facilitate the prospect for quick wins (9) for most stakeholder groups.

In the FODIKI framework, we have identified seven failure mechanisms, which we can link to the design principles as guides for intervention. For each failure mechanism, we describe which design principles are relevant, and then we give a few examples where we describe our diagnosis and proposed intervention.

The *incorrect use* failure mechanism relates to *substance,* as the receiver uses the shared knowledge differently than intended by the sender. Possible interventions include content insights being used in a facilitating way (13), and have an effect from coarse to fine (14). In thread IV, we saw the *incorrect use* failure mechanism occur. The CM (as third party) tried to reject the knowledge of the original sender, as intervention, which eventually dissuaded the stakeholder from taking up K of the original sender. We also saw the incorrect use failure mechanism occur in thread VI, but we suggested another knowledge transfer moment to inform the landscape architect what ideas the ensemble had and what the ensemble would like to see translated in the visualizations. The intervention was to tell the story in a different way and in different words.

Both the *institutional restrictions* and the *strategic power play* failure mechanisms relate to protecting the core values. In thread X, we saw that the *strategic power play* failure mechanism almost occurred when the administrators felt they have been put on the spot to make decisions that they could not support. They said that they were insufficiently included in the process and had the idea that the decisions conflicted with their role. In a response, the alliance members guaranteed that the decisions made would be a joint effort (principle 5 and 6). In the same thread, we saw that the *institutional restrictions* failure mechanism might occur when the 'spatial planning table' would not become a joint effort with the involved governments.

The *resources restrictions* failure mechanism relates to openness, as it typically occurs when content decisions are not transformed into process-related agreements. It also relates to protection of core values, as it may occur when stakeholders have no exit possibilities in case of insufficient resources. This failure mechanism occurred during a community consultation meeting in thread VII, where the context manager of the PT did not see any possibilities a by the residents proposed technical solution, because of the costs. The chairman intervened by indicating that costs do not yet play a role in that phase of the project. Indeed, the community consultation meetings took place in an inventory phase for the ensembles where the goal was mainly to generate ideas. This intervention of emphasizing that there are still many exit possibilities later on in the process fits seamlessly with both openness (2) and protection of core values (7).

The *dissipation* failure mechanism relates to openness and substance. Knowledge can dissipate (Szulanski, 1996; Brown & Duguid, 2001; Frishammar, Ericsson and Patel, 2015) for all kinds of reasons, for example because project stakeholders are given different roles or change employers. This also links to the 'constructed nature' of knowledge addressed in chapter 2. Situated knowledge must be secured in one way or another. Ideally, project team members work on a project from start to finish, but even then

participants can forget earlier shared knowledge, due to their other work. New entrants who lack prerequisite knowledge also cause knowledge situated in a group to dissipate. When new participants enter, it is important to ensure that they have or acquire the same knowledge base as others. During each meeting storytelling needs to take place, to highlight the chosen process design and to inform which steps have already been taken. In this chapter we saw the *dissipation* failure mechanism occur in thread X during an ELs meeting, where the ELs had forgotten their actions of the previous meetings. The only remedy is to share the knowledge again, such that all participants have the same knowledge starting point, and everyone is and remains involved in the process (14).

The *diffidence* failure mechanism occurs when a receiver interacts with another actor who by disqualifying knowledge weakens trust, which dissuades the receiver from taking up the knowledge. We learned that merely the suspicion that another actor will disqualify knowledge can already hamper knowledge uptake. Possible interventions lie in the domain of substance and openness, in particular transparency (3). In thread VII, the residents disqualified the possibility of an outward dike reinforcement suggested by the alliance, as they could not believe that Rijkswaterstaat would allow this. In thread VI, we diagnosed that the ELs were afraid for the possible disqualification of knowledge by the guests during the internal meeting. That is why the chairman proposed to draw up rules for this meeting. In FODIKI terms, the alliance anticipated the *diffidence* failure mechanism after the internal meeting. Process managers can also use the *diffidence* failure mechanism intentionally. In thread IV, the context manager (as third party) tried to disqualify the knowledge of an administrator by indicating that he was not in the position to declare that the plans would be realised.

The *no-relay* failure mechanism relates to progress and openness. We saw the no-relay failure mechanism occur in two threads: During the ELs meeting in thread I, a context manager rejected the way one ensemble interpreted the Environment Planning act, pointing out the (formal) role of governments. This rejection is a sign for this failure mechanism, as the context manager decided to not to take up the shared knowledge (principle 12 and 14). In thread X, we saw that the context manager had initially formulated an action correctly in the report, but when discussing the report the ELs were reluctant to carry out this action, because they felt that they had no mandate for this from their constituency. We did not propose any interventions in these threads, as the participants openly communicated that they had not taken up the knowledge, after which they jointly made new process-related agreements. Possible interventions would have been to postpone certain conflicts in the process to a later phase, to ensure progress (12). We have also seen this intervention in chapter 3 for thread C2-TD, where the formal auditor found that the quality of the reports sufficed to proceed to the next phase (C3 in Figure 3.2) and defer the remaining technical issues to this project phase.

By taking these design principles into account, a process designer can orchestrate interaction moments such that possible barriers and failure mechanisms can be prevented. For the design of a chain of interaction moments like thread IX and X, the process designer should consider which knowledge is to be shared, and why, taking into account the *a priori* knowledge and knowledge needs of the receivers. The FODIKI framework also provides more focus on the interweaving of the roles of experts and decision makers (design principle 13). The added value of our framework is determining

the knowledge needs, but then we go one step further by designing and organising the knowledge transfer in such a way that the knowledge transfer and processing effectively takes place. In chapter 2 we have shown, based on the existing scientific literature, that the framework is plausible. The threads described provide evidence that it can be used effectively in an action research spiral.

Depending on the arena, different types of interventions can be taken. In the administrative, often political context, other interests play a role, and sometimes stakeholders have strategic considerations not to share knowledge with each other. In such political contexts, it is a matter of promoting and defending one's own or organizational interests. In chapter 4, thread XIII, we saw that an alderman told the ensembles not to share sensitive knowledge with the municipal council, which was a form of power play by the executive. In the threads VIII, IX and X in this chapter, we saw that stakeholders sometimes were unwilling to share knowledge as they felt strongly about their interests. Different perceptions of the approach also cause trust in and between the administrators to vary. The process management approach of De Bruijn *et al.* (2010) describes a number of principles that may be useful in relation to the architecture and management of processes. However, as these principles do not specify how knowledge is shared and utilized, this still leaves room for a variety of scripts. The FODIKI framework provides guidance a the more detailed level of knowledge exchange in communicative interactions between participants in policy processes.

Policy network interventions

This category focuses on the actor network composition, and the activation of actors. In FODIKI terms this means that new participants can be invited to ensure that the required knowledge is available, but also that stakeholders are involved who are willing to share their knowledge, or whom the receivers find trustworthy. Other interventions include creating a future knowledge need with the receiver. Also, the process designer must consider the prior knowledge of the receiver, to ensure that the knowledge to be shared will help the receiver perform better or more efficiently, or will give him more power and status within his social group (see section 2.3). In the GoWa case, the researcher could not act on this, but she did emphasize the need to consider the stakeholder configurations at certain moments, when the project team was working towards the formal stage-gate moments. This type of intervention is not visible in the described threads, but the researcher did suggest interventions in interaction moments I_{103}, I_{110}, and I_{122}. For example, the alliance coordinated with several EMG executives to discuss progress and involved interests, and they involved consultants to give further meaning to the residential enjoyment component. In the early stages, the CMs and the researcher jointly discussed how the alliance could deal with the reactions of the involved parties, and who should be asked to help the alliance with this task. The researcher then advised the hired consultant and the CMs to share how the alliance is trying to deal with the received reactions. This led to many positive reactions from the participants. By bearing in mind the preconditions, the process designer can change the knowledge transferred during the meeting to match of fit the participants' needs.

Additional insights

Besides exploring interventions possibilities, we also gained the following insights. In a project like GoWa, with numerous knowledge interaction moments, the same knowledge is shared in different formal institutional arenas: SBG, AMG and EMG. For each arena, the knowledge should be shared differently, taking into account the social mechanisms identified by the FODIKI framework. In addition, the process designer should be able to play a directing role in who gives the presentations to stimulate the knowledge transfer and uptake, as different receivers ask for a different knowledge sharing process. Within the GoWa project we observed that professionals sometimes gave the exact same presentation for executives as for fellow professionals, which did not match the receiver's needs. In GoWa, we barely saw knowledge managers operate in institutional arenas. The added value of knowledge managers is to combine different sources of knowledge in such a way that the needs and interests of several actors are fulfilled. We believe that these knowledge managers would have been able to smoothen the process and manage the expectations of the executives around the community engagement approach, for instance in the threads VIII, IX, X. We have seen that knowledge must flow in and across the different stages and phases, and also between actors, because of institutional uncertainty. In thread VII and X, we saw that a process managerial intervention was required. We saw that he chosen community engagement approach at occasions conflicted with the formal requirements, for instance when the alliance had to organise walk-in meetings after the NRD was put on display by the Province (I_{98}), even though the residents had seen the information in two previously organised walk in meetings. Following the MIRT approach, as described in chapter 2 and defined in section 4.1 for DFPP projects, the process designer can refine, depending on the project characteristics and needs of the shareholders, the process design to work towards the formal stage gate moments.

In the threads, we also described the bilateral consultations between the researcher and members of the project team in terms of the FODIKI framework. The researcher acted as a knowledge manager who proposes observations, diagnosis and interventions, and gave comments and advice to the process manager. This critique and advice can also be seen as knowledge transfer, and in this type of knowledge transfer the barriers, failure mechanisms and other social mechanisms will also occur. The project team members (as receivers) have a need (N), should trust the researcher (as sender), and include the other preconditions for knowledge transfer and uptake. In the knowledge sharing process we also learned to adapt to share the knowledge in several ways such that the knowledge fits with the needs of the receiver. We also learned what actions may diminish trust in our independent role as researcher and what the consequences can be. We will reflect on this in Chapter 7.

In conclusion, the thread descriptions in this chapter show that we have been able to intervene in interaction moments, often effectively mitigating the barriers and/or failure mechanisms. This suggest that the answer to our fourth research question is positive, with the caution that to be able to intervene, the observer must have a keen insight, as the 'devil is in the details'. For interventions, there is no 'one-size-fits-all'; each knowledge interaction moment must be observed and diagnosed in its context to take the appropriate intervention.

The question that remains is to what extent the diagnoses made by the researcher can also be made by other professionals. In other words, is the method transferable to others? We will reflect whether the framework helps to be and become a better 'reflective practitioner' (Schön, 2017) in the next chapter.

6 Transferability of the method

We have applied the FODIKI framework for three different functions: (1) before meetings for prognosis, (2) after meetings for diagnosis, and (3) in real time during meetings to see if a timely diagnosis was possible to intervene in an interaction moment to enhance the knowledge transfer and uptake in a dike reinforcement project. In this chapter, we assess the external validity of the FODIKI methodology by examining whether the researcher's working method, including the associated language, can be transferred to third parties. We show that this transfer was possible in different scopes: in project scope (GoWa) the utilization reached the level of implementation, in organisational scope (within the RWA) utilization reached the level of reference with the prospect of effort. In the scope of the DFPP Programme, the uptake of the methodology extends to the level of cognition, with the prospect of reference. In all three scopes, knowledge transfer and uptake needs to be organized as interactions between individuals or small groups to be successful.

6.1 Transferability within a project scope

The FODIKI framework is consistent and proved to be effective in observing, diagnosing and interventing in more than 130 knowledge interaction moments, which indicates that the method is internally valid (Yin, 2011). For a methodology, external validity entails that other individuals should be able to apply it. In the GoWa case, the researcher acted as an expert in transferring the FODIKI methodology (K) within the scope of a project. We therefore applied the framework recursively to analyse the researcher's efforts to transfer this knowledge.

To define the uptake of the FODIKI methodology, we used the first six utilization levels of Knott & Wildavsky (1991). As explained in section 2.3, this scale is cumulative in the sense that each subsequent level builds on the previous levels:

- *Reception*: the FODIKI methodology is explained by the sender, but not necessarily digested and understood by the receiver;
- *Cognition*: the receiver shows understanding of the FODIKI concepts and methods, and provides feedback;
- *Reference*: the original receiver refers to FODIKI concepts in knowledge interaction moments; this becomes visible in interaction with others via documents, e-mail, or face-to-face communication;
- *Effort*: the FODIKI methodology influences the receiver's actions; the receiver can be seen to make efforts to put the concepts and methods into practice, or make efforts to transfer it to his colleagues or others;
- *Adoption*: the receiver starts using the FODIKI methodology and on a regular basis makes efforts to transfer it to others;
- *Implementation*: the FODIKI methodology is also used by the receiver's colleagues.

During the action research, the project staff and the researcher had several meetings to discuss the progress of the project and the researcher's observations. Especially in the reflection and re-planning stage of the action research spiral, the researcher frequently

collaborated with a context manager in the period between December 2015 and December 2018. During these interaction moments, this context manager had a need for knowledge: he wanted to know whether certain set-ups around, for example, the participation track or the internal communication would help the PT take the participants into account. In these moments, the researcher acted as the sender of her knowledge of the methodology she was developing. The context manager was also interested in the observations and interpretation of the researcher. Among other things, he was interested in what was needed for effective knowledge transfer. Through the reflection of the context manager (now as sender), the researcher (now as receiver) also learned and thus improved her diagnosis, based on the framework.

The central question for this section is whether the FODIKI methodology was effectively transferred during the three years in which the researcher was involved in the project, and to what level of uptake.

In the very first stages of the researcher's involvement in the Gorinchem – Waardenburg dike reinforcement project (GoWa), the knowledge interaction moments were mainly focused on explaining project team members what the FODIKI concepts meant and how they could be applied. From the very beginning, the researcher reflected together with the context manager after each meeting. The researcher attended both the project team meetings and the series of SBG-AMG-EMG meetings.

By examining three short episodes in the action research project process, we assess how successfully the methodology was transferred. The first episode took place about four months after the researcher became involved in the GoWa project, the second episode after approximately one and a half years, and the third episode after more than two years. In the description of these episodes we follow the pattern we used in chapter 4 and 5: we report (1) the context of the situation, (2) the observations and, if necessary, the aftermath and (3) our interpretation and diagnosis based on the FODIKI framework.

Episode 1: The first experiences of the project team with the method (April 2016)

Context: Starting in December 2015, the researcher observed in seven meetings, and shared her diagnosis for these meetings afterwards with the context manager, sometimes immediately after the meeting, sometimes by email, and sometimes through bilateral consultation. During a project team meeting in April 2016, the researcher diagnosed several barriers and failure mechanisms in the knowledge interaction moment (chapter 4, thread X). As only the project manager and the context manager were familiar with her methodology, the researcher believed that sharing her observations might help the project team. Therefore, she asked the project manager and the context manager whether she could give a presentation to the entire project team to tell more about her research and insights already gained. This presentation was scheduled a week later, and was attended by all project team members.

Observations: The researcher has prepared a presentation in which she first explains her research focus and the FODIKI framework in more detail. She explains the *barriers* using concrete examples, such as limited communication skills (cognitive barriers) and telling people to change their ways of working (psychological barriers). Using

recognisable examples for the project team members, she tries to create awareness among those present, which she links to the concepts in her framework. The project manager compares the sender – receiver model with the 'Chinese whispers' game, in which players form a line, and the first player thinks up a message and whispers it into the ear of the second player in the line. This player repeats the message to the third player, and so on. When the last player is reached, this player announces the received message to the entire group. This message is typically different from the original. He also says that each individual has different images with certain concepts or uses a 'memory aid' to remember things. The researcher also gives her observations and diagnosis of the last SBG meeting, such that she shows that her framework helps to make barriers and failure mechanisms explicit.

While the researcher is reflecting on the last SBG meeting, the project manager asks whether the researcher believes that the project team pays insufficient attention to the needs of the participants. Before she can respond, the context manager says that he believes this to be true and adds that it is fairly easy to prepare these meetings in advance. He explains that he has benefited greatly from such preparation at the second SBG meeting, and that he believes that the project team and its individual members, himself included, should prepare such meetings more in advance, and discuss the knowledge needs with each other. The researcher concurs and gives her reflection on the last project team meeting in layman's terms, i.e., not using the FODIKI methodology. The context manager and project manager agree that the framework provides valuable insights, such as the differentiation in needs of participants, the lexicon of the participants, and to link the intended message to both aspects, for the preparation of follow-up meetings. The other PT members state that they see the added value of this research for their project and are interested to learn more during the research.

Analysis & interpretation: Partly because the framework was still under development and partly to keep it understandable for the project team members, the researcher translated the FODIKI concepts into terms that match the language of the recipients. For this moment, she considered understanding the framework and using concepts in their own wording as more important than the exact scientific terminology. The project team members (R) were interested (N) what type of research the researcher carries out and what the expected results are. The researcher was mainly focused on transferring her method and her experiences until that moment (K). That the PT members wanted to learn of the researcher, suggests the trust (T) of the project team in the researcher.

During the presentation, the PT members asked clarifying questions, and commented on experiences, see also chapter 4 thread X, indicating *cognitive* barriers. Through feedback, these barriers were mitigated. The context manager and project manager showed cognition of the FODIKI framework, since they used the FODIKI concepts correctly when referring to the valuable insights, and the comparison with the 'Chinese whispers' game. This suggests that the researcher has created awareness of the added value to pay enough attention to the knowledge transfer and knowledge development at the meeting. The participants show uptake (U) to the level of *cognition* and some, especially those who have been working with the researcher before, to the level of *reference*, but not beyond as they talked about the framework but did not apply it.

Episode 2: Ensembles share their vision with their community (January 2017)

Context: Around the ensemble participation process, the researcher could play an active role, because the project team allowed her to observe (O), diagnose (D) and intervene (I) with the FODIKI framework. The context managers and the researcher had made agreements about the method of intervention. In certain meetings, such as EL meetings and SBG meetings, the researcher could intervene in real time, while in others she would communicate her O-D and suggestions for I afterwards to the project team. At the community meetings, the researcher could also intervene in real time, but only indirectly via a project team member. These community meetings took place at the beginning of January 2017, when the ensembles shared their vision with their fellow residents, and asked for feedback (cf. chapter 5, thread VII). In the first community meeting the context manager acted as chairperson.

Observations: During the first community meeting, the researcher communicates non-verbally through eye contact with the context manager that a barrier occurs in the meeting. The context manager briefly asks the researcher which barrier it concerns, the researcher indicates a cognitive barrier, the context manager knows enough and intervenes by clarifying the role of the ensemble in question, and better introducing the presenter at that moment.

In the meetings that follow, the context manager and the researcher still exchange knowing glances, but the context manager already knows which interventions he can take to avoid barriers or remove them.

Aftermath: After the summer of 2017, the alliance organises 16 participation meetings. For these meetings the researcher has drawn up a hypothesis concerning possible barriers and failure mechanisms. Based on the script for these meetings, her hypothesis is that the residents will not react immediately because the presenters do not show examples. In her framing, the alliance was the receiver, seeking knowledge from the residents, while she anticipates that the residents would not see themselves as sender but expect to gain more knowledge. She predicts among others cognitive and psychological barriers and the incorrect use, institutional restrictions, diffidence and, no-relay, failure mechanisms. She shares this hypothesis beforehand and discusses it with the context manager. She asks whether the context manager also can observe during the meetings, and give feedback based on his observations. The context manager tries to observe, but only partially succeeds, as he also plays an active role in the meetings. Based on his limited observations, he did intervene on several occurrences of a cognitive barrier (lack of a common language). He indicates that he has difficulties in diagnosing failure mechanisms and the presence of trust. In the participation meetings attended by the researcher, some previously predicted barriers and failure mechanisms appear to occur (cf. chapter 5 thread IX). Some of these barriers appear to be caused by the process design. SBG members agree, as they tell in an SBG meeting, that the residents felt that they were set against each other. SBG members also report that their constituencies told that they expected to gain knowledge and were unable to reflect. The context manager tells the researcher that the feedback from the SBG made him realize that the hypothesis drawn up in advance by the researcher is confirmed, that trust is important, and that he has the impression that the alliance lost some of the trust of the residents during the meetings. After this series of meetings, we see that the context manager tries more explicitly to transfer the acquired knowledge to his colleagues.

Analysis & interpretation: The context manager was able to intervene in a timely manner, and from now on, he could observe and diagnose cognitive barriers. This suggests that the context manager had internalised this concept well, that the know-how transfer was successful, and that the uptake (U) of the methodology reached the level of *adoption* for the cognitive barriers. For the other barriers and failure mechanisms, the U was between *effort* and *adoption*, as we had no observations indicating that the context manager was able to diagnose and act on these concepts. The overall utilization level (U) of the methodology reached the level of *effort.*

Episode 3: Informing the residents, interest groups and other authorities about progress (April 2018)

Context: The Graaf Reinald Alliance (GRA) was in the phase of developing the preferred alternative based on the investigations and input they received from third parties. From time to time, they wanted comments and advice from local authorities, among others, as to whether the taken steps were traceable, and whether the executives still had concerns regarding this dike reinforcement. As an intermediate step, the GRA had drawn up a Report on Scope and Level of Detail (*Notitie Reikwijdte en Detailniveau*) This document was made available for inspection by the Province (being the competent authority) so that stakeholders could give formal reactions. The next step was the formal adoption of the preferred alternative by the General Board of the RWA (preferential decisions as depicted in Figure 2.1, page 14). The GRA was organising two information meetings on this subject. The purpose of these information meetings was to inform the residents about the content of the *Notitie Reikwijdte en Detailniveau*, and also give the residents a 'look behind the scenes' of efforts of the GRA to ultimately arrive at the preferred alternative.

Observations: The GRA and the ELs discuss the invitation letter (cf. chapter 5, thread II). Based on the script, the researcher makes *a priori* hypotheses as to whether and which barriers and failure mechanisms could occur. In a brief preliminary discussion with the context manager, the researcher indicates that the needs of residents are not static but will change once a particular need is met. The researcher characterises this as Eric Carle's Hungry Caterpillar: given their personal drivers and grounds, residents will want to know more each time until every detail is known exactly around the dike reinforcement. At the next AMG meeting (I_{99}) and SBG meeting (I_{100}), the context manager comments on the information meetings. Some AMG members then ask how the residents experienced the message. The context manager says that the residents, as with every residents meeting, want to know more than the alliance can tell at that moment. He points out that the residents behave like a hungry caterpillar, and increasingly want to eat more. He explains that some residents understand the developments and express their appreciation for the open and transparent communication of the alliance. The context manager adds that during the last SBG meeting some SBG members said that the residents cannot process too much information at once, and that it is important to proportion the information and to tell it in understandable language. He says that he concurs with these SBG members.

In a next bilateral consultation with the researcher (I_{105}), the context manager shares his observations on how internal colleagues had prepared for these two information meetings. He remarks that his colleagues paid insufficient attention to inform their

colleagues about what the general message of the evening should be, and what the alliance colleagues could and could not tell. He adds that when he shared this insight with his colleagues, they agreed and promised to address this concern in the next meetings.

A few months later, the GRA organises new information meetings (I_{121}), this time specifically for the preferred alternative. In preparation, the GRA organises a meeting (I_{118}) in the summer period with the ELs and SBG members. During this meeting, the GRA presents what they intend to show at the information meetings and what their message is, and invite the Els and SBG members to react on the visualization maps that they intend to show. These then give valuable feedback, and restate their opinion that the information is well proportioned to share with the residents.

The researcher and a GRA employee discuss the intended message during this meeting (I_{118}). The researcher comments on the maps and suggests a few changes in the programme. She also asks about the preparation to inform the GRA colleagues of the intended message during the meeting. The context manager tells her that he and his colleagues are preparing this meeting. His two colleagues will brief the other GRA colleagues in a meeting.

In the next bilateral meeting, the context manager tells the researcher that he was unpleasantly surprised at the briefing meeting, because he had to improvise on the spot. His two colleagues who had promised to do the briefing left it to him. He reports how during the briefing he emphasized that the GRA colleagues should only explain the visualisation maps that are on display, and that the GRA colleagues should not tell more, because further detailing is not yet possible. He tells that they should refer detailed questions from the residents to the content experts, so that all residents receive the same information. The context manager also indicated that the FODIKI framework helped him to prepare meetings by thinking about each variable in the framework.

Aftermath: In next meetings, some GRA colleagues also experience how knowledge transfer can fail. From that moment on, they tell that they think more explicitly about the needs of residents and how to communicate the intended message.

Analysis & interpretation: At various moments the context manager showed that he is capable of observing and applying elements of the framework. He is capable to tell in his own words that the knowledge needs of residents change, but also uses the exact terms used by the researcher. The context manager made several efforts to share the FODIKI methodology to his colleagues. Here we see that, just like the researcher in the threads in chapter 4 and 5, he must make an effort to first create awareness and gain trust from the receivers. The preparation of the context manager with the FODIKI methodology suggests that the uptake (U) of the methodology reaches the level of *adoption*, but we also see the first signs of the highest level of uptake: *implementation*, as his colleagues now also appear to make attempts to use the framework.

Master-apprenticeship further explained

The three episodes with the context manager provided evidence for the effectiveness of knowledge transfer. At first, the researcher often explained the framework in layman's

language because the model was still being developed, while later we saw the researcher and the context manager have joint discussions using the researcher's terminology. The context manager learned to use the FODIKI terms, thus creating a common language while removing the cognitive barriers. The context manager had several years of experience in that role, and is naturally open to feedback and new insights. No psychological barriers occurred, because the method and research method were in line with his professional and personal values and identity. He saw the researcher as someone who could help him to become an even better context manager. He did not have to change his beliefs to adopt the ideas of the researcher.

The relation between the researcher and the context manager, and later also between the context manager and his alliance colleagues, can be seen as a master-apprenticeship relationship (Barab & Hay, 2001; Pratt, 1998). Apprentices work side by side with an expert to learn a specific task. Characteristic for this relationship is that the apprentice also shares knowledge obtained through the observations with the master. In this way, the master also continues to learn. According to Pratt (1998), successful maturing through apprenticeship requires that the learning process must be active, social, and authentic. In our case, all three conditions were satisfied:

1. *Activity* concerns the level to which the learner is physically and mentally stimulated within the environment. From the start, the context managers were enthusiastic about the novel approach to community engagement, and were open to learning.
2. *Sociality* means that the apprentices must interact constantly with the tools for success, the experts, and the beneficiaries of the work. The researcher often operated as a 'fly on the wall' at meetings, allowing her to observe and diagnose. Over time it became a habit for the project team members to reflect after meetings, so that new insights could be applied quickly.
3. *Authenticity* is essential in apprenticeship. The apprentice must be able to make a connection between his work and its relevance for the public and to explain this. The master-apprentice relations also stimulate situated learning (Lave & Wenger, 2001). An engineer typically knows all the technical insights related to redesigning a dike, but he also needs to understand how most people perceive his work and how he can explain his work in layman's words.

In the master-apprentice relation, learning takes place via participation in a community practice, which is in line with what Lave and Wenger call 'legitimate peripheral participation'. This type of participation shows how newcomers become experienced members and eventually specialists (Lave & Wenger 1991). In the master-apprentice relation between the researcher and the context manager, we observed a learning trajectory around the ensemble participation process. The researcher could regularly intervene during meetings, and they also discussed on what the next steps would be in this community engagement approach. The master-apprentice relation was not continuous but changed when the Graaf Reinald Alliance started. More context managers came on the project, and with their arrival, the researcher experienced that she had the need to rebuild mutual trust and show what her added value was for the project. This took time, and the position of the researcher was weaker in this phase, as she could only make hypotheses in advance or reflect afterwards on meetings, and advise on changes in the process design.

The newcomers in the project also worked from their own familiar scenarios. In section 4.1, we mentioned that the community engagement approached the RWA,aimed for was, and still is, new in the field of Flood Risk Management. After the start of the GRA, we diagnosed a sequence of institutional failure mechanisms (cf. thread XI, chapter 4). The researcher, and later also the context manager, saw that 'the old ways' led to loss of trust in the GRA by the residents. The researcher then tried to offer the context manager tools for transferring the insights that were valuable to him. The researcher explained that awareness of the need for careful knowledge transfer and knowledge development is essential for the success of a project. Lave & Wenger (1991) express that this awareness can ensure that those involved behave as 'legitimate peripheral participants'. The added value of the researcher was her diagnosis and reflection on potential interventions to enhance the knowledge transfer and uptake. She gradually gained trust, and in the period June - October 2018, we see that the other project staff members explicitly looked for the knowledge needs of others and mentioned them regularly. In the preparation of several information meetings (I_{120}), the project staff members explicitly requested comments and advice from the ELs and SBG members in advance (I_{117}) to ensure that the message of the meeting would match their knowledge needs. Albeit in their own language, they also made more use of the basic concepts of the FODIKI framework. We see this as the result of the efforts of both the context manager and the researcher, because they also regularly share their observations and diagnosis with these employees.

In sum, the researcher succeeded in transferring the FODIKI methodology in project scope via one of the context managers. Several project employees adopted the insights they gained from this context manager and start acting accordingly. This suggest uptake of the FODIKI methodology to the level of *implementation.*

6.2 Transferability within the scope of an organisation

In this section, we consider transfer within the scope of one organisation: a regional water authority. Here, too, we want to investigate whether the FODIKI methodology can be transferred to other stakeholders, such that they can use the ODI for knowledge transfer and uptake. The FODIKI framework is the 'know what' (episteme) that is being transferred by the researcher to members of the Programme Team Dike reinforcement and the Policy and Strategy team (as receiver). The researcher would *plan* for a meeting where she tried to mitigate barriers, and often chaired the meeting while simultaneously observing directly and/or afterwards by means of questionnaires. Our aim was to raise awareness that on an organisational scope, knowledge transfer and uptake takes place between individuals, and using the FODIKI methodology could enhance this. The central question was In other words, they should show *cognition* and *reference* to the FODIKI methodology, and occasionally *effort* to enhance the knowledge transfer and uptake.

Regional water authorities (RWAs) carry out a wide variety of projects. Until 2050, many dike reinforcement projects are planned to be prepared and executed following the MIRT approach. When we started our action research in 2015, the RWA Rivierenland had already gained experience with the redesign processes of flood defences with DFPP-2 and the programme 'Room for the river' (in Dutch: *Ruimte voor de Rivier*), and had several projects in preparation for DFPP. These DFPP projects varied in what stage they

were, and offered opportunities for sharing knowledge and experiences. Each DFPP project had its own dynamics and characteristics: in some projects the RWA gained experience with a specific citizen participation approach, in another project they learned about an integrated market approach, and in some projects the RWA gained a new technical skill in the elaboration of the project towards the preferred alternative. In each of these projects, the RWA developed both 'know how' and 'know what'. Such 'know what' is easily transferred as it can be laid down in documents, whereas 'know how' often relates to tacit knowledge and needs to be transferred by storytelling (Levin & Cross, 2004). This led to the question how these different types of knowledge can be shared, and how the receivers can easily adopt the gained experience, thus ensuring that other projects can benefit from it.

Since 2016, Knowledge management was an important theme at different levels in the RWA. Employees perceived that a wide variety of knowledge was available, but they were seeking for effective tooling to transfer the knowledge. In 2017, the Dike Strengthening programme team had knowledge uptake as one of the focal points in their annual plan (WSRL, 2017). This created a window of opportunity for the researcher to share her knowledge in that area. Her aim was to provide the RWA employees a common language to talk about effective ways for knowledge transfer and uptake. The researcher believed that FODIKI would provide a conceptual basis for being well prepared to share and adopt knowledge within the primary processes of the RWA and by the projects themselves.

In the remainder of this section we will describe three episodes:

1) During a team session of the Policy and Strategy team of the RWA, the researcher was asked to inform the team members about her research and the results so far. Her aim was to create awareness that knowledge transfer and uptake are essential in design processes.
2) In a series of knowledge interaction moments, the researcher shared the FODIKI methodology with two consultants of the Policy and Strategy team of the RWA. Here, her aim was to give the consultants practical tools for sharing knowledge.
3) In another series of knowledge interaction moments, the researcher aimed to create awareness that knowledge transfer and uptake among projects is essential. She shared the FODIKI methodology with members of the Programme Team Dike reinforcement to sensitize them. This team has a directing role for all dike reinforcement projects within the RWA. The researcher tried to offer practical tools to stimulate the knowledge transfer and uptake between the DFPP projects within the RWA.

These episodes report our action research within the RWA, similar to those in the previous section, but focus on knowledge interaction moments in different settings with different RWA colleagues.

Episode 1: Awareness game 'from experience to uptake' for the Policy and Strategy team– June 2017

Context: The researcher was asked by two professionals from the Policy and Strategy team, including the team leader, to tell something about her research and the

results so far during a team session. The researcher (S) did not only want to inform the participants (R) about her research, but wanted them to actually experience the importance of knowledge transfer and uptake in everyday work. For this purpose, the researcher developed a 'serious game' (Mayer, 2009) for this purpose, that would make the participants feel that the experiences from the game setting were similar to what they experience in their own work, and that they could reflect on this, through the FODIKI concepts. This approach is in line with the Kolb's four-stage learning cycle (2009). For the development of the awareness game, the researcher used the action research cycle (plan – act & observe – reflect – re-plan), where she reflected twice: first with the participants during the game, and afterwards based on her own observations and the feedback received from the participants. The game was developed such that the psychological barrier could not occur, as the game was in line with the participants' real-world experience.

Game description: The aim of the role-play is that participants come to appreciate that knowing the other party's knowledge needs is important, and that various interventions are possible to enhance knowledge transfer and uptake. The maximum duration of the game is 90 minutes. The game requires 12 or more persons. We distinguish different roles in the game, namely three RWA employees (W1, W2, W3), three technology providers (Ta, Tb, Tc), three observers for the integral behavioural aspects, and three observers for the content. In round 3 of the game, the observers for the content play the role of the board of directors.

The setting of the game is as follows: The RWA must make a well-considered choice between three innovative techniques for strengthening a primary flood defence at a certain location. By gaining experience with one of these techniques, the RWA expects to be able to carry out its task better, faster, cheaper and/or more sustainably. All three techniques score equally well on aspects such as sustainability and testability. Each RWA employee has, in his personal role description, additional information about the pilot location, which can lead to a more substantiated decision for one specific technique in round 2, if shared. The three RWA employees have additional information for the intended pilot location. In the role description of the technology providers, we also included some fictitious concepts. The players need to use their creativity to persuade their interlocutor of the importance of these concepts.

The game is played in three rounds to transfer knowledge and to make decisions. In round 1 (information phase), the RWA is informed by the technology providers about the (im)possibilities of the technique. In this round, three conversations take place in parallel: (1) W1 and Ta, (2) W2 and Tb, and (3) W3 and Tc. In round 2 (decision-making phase), the three RWA employees (W1,W2,W3) share the information gained among themselves in round 1 and arrive at an assessment, in which they have to choose the — in their opinion — best technique for the pilot location, and in round 3 (presentation phase), they (W1,W2,W3) defend their decision for the preferred technology provider to the executive board of the RWA, who must then reach a formal decision. In each round, several observers listen to the substantive message as well as the attitude and behaviour of the interlocutors. The researcher has framed these observers by handing out tables and lists that mention the aspects of interest, based on the FODIKI framework.

Three Kolb stages are used in the game, namely (1) having a concrete experience (playing the game) followed by (2) observation of, and reflection on, that experience (debriefing) which leads to (3) the formation of abstract concepts (analysis) and generalizations (FODIKI framework). In the debriefing, the players share their experiences with each other. The game leader asks what their general impression is of the game, the experiences per role, and the possible link to their own practical experiences. Finally, the researcher tells more about her own research.

Observations: The game is played on one of the warmest days of 2017. The sunshine and casual dresscode contribute to an informal atmosphere. The researcher only knows two persons from the Policy and Strategy team. After lunch, the team leader welcomes the researcher and explains to his team members that she has been invited to tell more about her insights gained at the RWA. After this introduction, the researcher takes the floor and briefly explains the game, clarifying the rules and roles, and states that she will act as the game leader throughout the game. She then invites the 13 participants to indicate which role they would like to play. The group splits into three, after which everyone starts reading their role description.

After a short reading period, round 1 of the game starts. The participants interpret the role description differently, which leads to three different parallel conversations. W1 and Ta start to discuss how they should interpret their roles, and only start their intended conversation after the researcher explains that it is a role-playing game, in which they can also give their own input. W2 and Tb get off to a dynamic start and continue their conversation until the bell rings for the next round. W3 thoroughly questions Tc about the added value of the technology. Meanwhile the observers watch what is happening during the conversation and note what they see on an observation form.

In round 2, the three players in the RWA employee role (W1,W2,W3) present and explain the techniques to each other. It turns out that no single technique stands out. They indicate all kinds of pros and cons of the technique, and do not want to choose one specific technique, even though this is a game requirement. They also indicate whether they have confidence in the technology provider. The technology providers, who now sit in the audience, react surprisedly. After some persuasion from the researcher, the three RWA employees eventually choose a technique based on several criteria (which had already been put forward in the game). In round 3 they present this choice to the board. The directors then ask some critical questions that are not in their game description, but originate from the professional experience of those who play this role. At a certain point, the researcher stops the game to have sufficient time to reflect together on what happened.

The debriefing of the game starts with sharing general impressions. The participants tell the researcher that they find it an interesting game, which could even be played without prior knowledge. They also tell that they are surprised how the game developed over time and how role players acted. One technology provider express that he had a completely different perspective on the agreements he made with the RWA employee in round 1. In the reflection per role, the technology providers indicate that they believed to have made good agreements with the RWA employee in round 1 to advance a technique, but that they saw that in round 2 these agreements were not included in the discussion

between the three RWA employees. They also report that the information they shared was transmitted differently, giving them the impression that their discussion partner did not properly understand the information. The RWA employees indicate that they found it difficult to make a choice in round 2 at all, as none of the three techniques appeared to be better. The observers of the three rounds report that the shared knowledge is well transferred, but that there were insufficient questions for clarification from the W1-W2-W3 roles. The observers also report that some RWA employees appeared not to trust the information from the technology provider because they made repelling gestures or started asking critical questions about the technology.

When all experiences have been shared, the researcher asks the participants if they ever experienced in their work that knowledge was not successfully transferred to others. The team leader is the first to respond by telling an anecdote from his own recent experience, on how knowledge was shared during a large meeting. Several other participants then share similar anecdotes, indicating that they sometimes felt that a certain subject was raised again as a focus area a few months later, while they thought that this hurdle had been taken in the coordination. After sharing some experiences, the researcher tells more about her research and introduces FODIKI methodology, while sharing insights gained in the KIS case and GoWa case. During the presentation, the attendants tell more of their own experiences in connection with the experiences of the researcher. Some participants use the terms *sender*, *receiver*, *trust*, *needs* and *drivers* while telling their experiences. One participant tells that he felt that there was often too little time to thoroughly design a meeting, and that 'we barely considered the needs of the participants'. Several participants address the importance of trust in the information and in persons. The participants also ask additional questions about possible knowledge interventions and how they can make a proper process design, while considering the elements of the researcher's framework. The researcher tells that she is currently developing the 'toolbox' of potential interventions. The team leader concludes the session by asking whether his team members see opportunities to spread the insights gained more widely. Some indicate that they want some intervision/adjustment to help them prepare their interactions better.

Aftermath: A few weeks after the team session, the researcher has a discussion with the team leader and his colleagues to come to a follow-up session. Her aim is to share the FODIKI methodology such that RWA colleagues can enhance the sharing of information. The researcher agrees to start an intervision trajectory with an advisor from this team. The researcher also conducts a short survey among the team members, a few months after the game is played, in order to check whether they have given more thought to the way in which they transfer knowledge and work on it. Of the 13 participants, 10 responded, 6 of whom responded that they still thought about this, but needed tooling. The respondents refer to elements of the FODIKI methodology in subsequent meetings, such as sender, receiver, trust and needs.

Interpretation & analysis: Several participants contributed actively to the debriefing and reflection on the game, while sharing their knowledge and experiences. By designing the debriefing in this way, situated knowledge was shared within this team. Several times the participants had an 'aha!' moment, because they saw similarities in the insights that the researcher shared. This is in line with the direct learning through experience,

whereby knowledge is created within a group through the transformation of experience. ´Knowledge results from the combination of grasping and transforming [situated knowledge and] experience' (Kolb & Kolb, 2009).

In the debriefing, some participants tried to use elements from the framework to articulate their situated knowledge, and others used wordings that can be linked to the variables of the FODIKI framework. At the end of the session, the participants asked additional questions regarding possible knowledge interventions and how they could make a process design, considering the elements of the FODIKI framework. At that time, the researcher was still developing the set of possible interventions linked to the set diagnosis, and could therefore not give a thorough answer. The direct learning through experience suggests uptake of the FODIKI methodology to the level of cognition. The conducted survey also showed that the uptake of the FODIKI methodology reached the level of *cognition,* and some RWA colleagues showed *reference*.

Episode 2 Intervision trajectory with two consultants in the domain of sustainability (September 2017 – January 2018)

In the aftermath of episode 1, a senior consultant, working in the field of sustainability, indicated that he wanted a form of intervision with the researcher. In consultation with the leader of the Planning and Strategy team, they agreed on a process involving the senior consultant as well as a junior consultant. The two consultants and the researcher jointly designed the 'learn how to learn' trajectory.

Context: RWA Rivierenland aims to carry out its tasks in an energy-neutral manner (WSRL, 2019). The two consultants in the field of sustainability were looking at ways in which this can be put into practice. Among other options, the RWA was considering allowing wind turbines within its area, and therefore carried out an inventory of suitable locations. At one specific location, The province considered between three and five wind turbines to be potentially feasible. The idea of the RWA was that local residents could benefit from the wind turbines by jointly exploiting the turbines via a corporation. In an information meeting held in 2016, the RWA promised that the wind turbines would only be permitted if there was sufficient support from the involved stakeholders. The RWA invited interested parties to come up with a plan. A few local residents held a questionnaire in their neighbourhood in an attempt to quantify the support from their own community. The RWA intended to organise another residents meeting to inform the residents of the latest development, as they had promised to do so. At this moment, the researcher became involved to think along with the two consultants. To prepare for this residents meetings, the consultants organised several meetings, among others a preparatory meeting with a hired expert and chairman.

The researcher used a recursive process of experiencing, reflecting, thinking, and acting, such that the consultants could increase their learning power (Kolb, 2009; 1984). 'Immediate or concrete experiences are the basis for observations and reflections' (Kolb, 2009), which could lead to new insights, which can be tested in practice, and serve as a guideline in the creation of new experiences. Given this context, we planned six steps:

(1) Based on the presentation given by the researcher directly after the role-play in the previous episode, the consultants draw up their own individual analysis of how knowledge transfer and transfer currently takes place for this specific context (homework).
(2) During a work session, the researcher and consultants explore this situation in more detail and together they make an inventory of the possible barriers and failure mechanisms that may occur.
(3) The consultants consider which follow-up steps/interventions are possible or are already deployed to mitigate the possible barriers and failure mechanisms.
(4) This inventory forms the starting point for two preparatory meetings for the residents meeting between the consultants and the researcher, during which they share their insights with each other with a connection between the knowledge from practice and science.
(5) The consultants will then apply the gained insights in a residents meeting. The researcher attends this meeting to observe.
(6) Afterwards, the researcher and consultants will reflect on the meeting and the steps taken, and together they will assess whether the consultants can take these steps themselves in the future.

We will now analyse four specific situations in this episode. For each situation we first sketch the context, we then describe the observations and, if necessary, the aftermath, and finally we reflect, interpret and diagnose based on the FODIKI framework.

Step 1 + 2: Homework + first work session

Context: Prior to the first work session (step 2), the researcher asked whether the two consultants involved – based on the framework – could give their own interpretation of the citizen participation in the wind turbine project in terms of knowledge transfer (step 1). To get an overview of the situation, the researcher provided a template for the consultants to fill in. In the template, both consultants first sketched a chronological overview of activities around the specific project, and then applied all the variables of the framework. Then they both sent their work to the researcher. Here, we focus on the first work session.

Observations: At the start of the work session, the consultants explain the issues at stake in more detail and further specify the role and position of the RWA. The researcher asks several questions to better understand the situation. She also asks additional questions about the role of the RWA and whether the RWA had formal grounds in pursuing the development of wind turbines at this specific location. The consultants indicate that, when completing the template, they had difficulty in defining the knowledge need for the large group of residents. Both consultants reflect on the held residents meetings. The researcher clarifies the FODIKI methodology, and reasons from the needs of the involved stakeholders and their associated grounds, and tries to find out which stakeholders have a role in the process. The senior consultants gradually start using elements of the FODIKI framework, namely trust, sender, receiver and needs. In addition, he tries to reflect based on the barriers and failure mechanisms. He says that the FODIKI methodology 'seems to require a different way of thinking'. The researcher responds that the consultant cannot rely on is autopilot, but that it requires time and effort to adapt and observe the FODIKI

barriers and failure mechanisms. When the consultant further reflects on the held residents meeting, he says that the RWA had some trust of the participants, partially due to the presence of an independent chairman. The senior consultant also says that he feels that in similar meetings the receivers do not always understand the information he shares. He gives several specific examples and describes how the receivers reacted differently from what he expected. He states that he considered the failure mechanisms of the framework, but that he could not apply these yet.

In a response, the researcher explains more about the failure mechanisms and provides examples on how one can identify them. Finally, the consultants and the researcher describe the desired outcome of the next residents meeting. The researcher offers to send a document with advice to help the consultants formulate the intended message, but also to further outline the relevant stakeholders, their expected knowledge needs and the presence of trust.

Reflection: In the work session, the researcher shared her knowledge of the FODIKI methodology (K) and acted as sender. Both consultants were receiver, and their need (N) was to learn how to share information more effectively. At the same time, the researcher also analysed these interaction moments with the FODIKI methodology, but here we focus on the knowledge transfer between the researcher and consultants. We saw that trust (T) existed between the consultants and researcher, as they openly shared their experiences. We saw a *psychological* barrier, when the senior consultant said that he had to think and prepare meetings differently, based on the shared knowledge. The consultant experienced the mechanism of cognitive dissonance. Both consultants showed awareness of the importance of knowledge transfer and even tried to use the different FODIKI variables while reflecting on the previously held residents meetings. This suggests uptake of the FODIKI methodology to at least *cognition* and the first attempts of *effort*.

Step 3 + 4a: Inventory and first follow-up consultation

Context: A few weeks later, the two consultants invited their colleague from the Communications department and the researcher for a session to make an outline for the yet to be planned residents meeting. Prior to this session, the researcher sent a document to the consultants asking them to describe the stakeholders and their expected need for knowledge. This included a question on whether there was trust and how this had been expressed to date, and also some questions relating to the intended set-up of the evening, such as the information that would be passed on, what the overall needs of the participants were, and what barriers could be anticipated on.

Observations: At the start of the session, the senior consultant mentions that he has not completed the document but will do so after this session. In the conversation, the group has an open discussion and brainstorms on the intended outline of the residents meetings. The researcher asks several times more in-depth what the expected outcome is according to each of the consultants, and whom they expect to attend the residents meeting, and what their needs might be. The consultants state that they predominantly expect residents. The researcher then dives into this category and invites them to define subcategories, such that the different needs become visible. The consultants make first steps to divide the residents in different categories, with accompanying needs. The

researcher asks about the rough set-up of the residents meeting and who will attend the meeting as delegate from the RWA. The consultants indicate that probably one of the dike board members will attend, as he did the previous time. They jointly discuss who will give a presentation and what the needs of the attendants might be. Here, the consultants use terms such as sender, receiver, needs and trust. They ultimately discuss who makes a draft of the invitation letter for the residents meeting. The researcher offers that she will also reflect on this letter. The intended location of the residents meeting and the seating arrangement are also discussed. The consultants react positively to the researcher's points of interest and actively think along with the researcher. At the end of this session, the researcher asks whether the senior consultant can formulate a main message in such a way that the design of the meeting can be adapted to it. The consultant agrees that based on the held discussion, he can formulate the information the RWA wants to share.

Aftermath: After this session, the researcher calls the senior consultant to emphasize the need for careful preparation. She highlights that she can only have added value as a researcher when the consultants do their 'homework' in time. The consultant is aware of this and indicates that he is satisfied with the input of the researcher during the session. 'It helped me to organize my thoughts and to see what the purpose of the meeting will be'. He states again that he feels he has to change his way of working, but that this change requires time, which is scarce at this moment. The researcher responds that adopting a different way of working takes time and can feel as difficult.

Reflection: During this session, the senior consultant made attempts to apply FODIKI concepts. Both consultants started to categorize the expected participants of the residents meeting in more subcategories and identifying the different needs. We also saw that the consultants started to think about the intended message for the residents meeting, which suggest the uptake of the FODIKI methodology to the level of *effort*. The senior consultant stated in the telephone call that he was aware that he must adapt to a new way of working, which suggest the cognition for the FODIKI methodology. His remark during the same conversation that time is scarce suggest the occurrence of a *resources restrictions* failure mechanism.

Step 4b: Second follow-up consultation

Context: This consultation meeting in preparation of the residents meeting was also attended by a hired expert in the field of sustainability, and by the external chairman appointed by the RWA (the same person who chaired the previous residents meetings). The aim for this meeting was to discuss the potential set-up for the residents meeting.

Observations: At the start of this session, the senior consultant tells that he has formulated the main message for the residents meeting: the RWA is still prepared to allow wind turbines on their land, and finds it important that the local residents benefit from the turbines via a local energy cooperation. However, as the senior consultant explains, the RWA cannot tell much about the progress, as they are still looking for a local partner that wants to start this energy cooperation. The senior consultant says that he wonders whether the RWA is going to tell new things during this planned residents meeting. The chairman says that he is looking for the added value of the residents meeting. They jointly discuss recent developments, among others the results of the questionnaire held

by local residents in an attempt to stop the wind turbine installation in the near vicinity of their properties. The expert tells that these residents tried to dismiss the plan for the installation of wind turbines with the results of the questionnaire. The expert explains that in the held residents meeting the RWA said that they would stop this process if there was insufficient support from the relevant stakeholders, but failed to define 'support'. During the discussion, the importance and definition of public support comes to the fore.

The senior consultant mentions that based on their conversation, he is still considering the formulation of the main message. He says: 'I have to think about the message, and I want to practise it, also to prevent possible barriers and failure mechanisms as identified by the researcher's methodology'. At the end of the meeting the attendants make a draft agenda of the residents meeting. The external chairman of the day agrees to flesh this out. At the close of the meeting, the senior consultant invites the researcher to explain her role in these meetings and what the purpose of the intervision trajectory with the consultants is. The researcher explains the main concepts of the FODIKI methodology. The senior consultant tells the others of the added value of the FODIKI methodology in carefully preparing knowledge interaction moments.

Aftermath: After this meeting, the external chairman of the day, the two consultants and hired expert in the field of sustainability finalize the draft agenda for the residents meeting.

Reflection: We saw that the senior consultant used FODIKI terms to prepare the information that he wanted to share during the residents meeting. This suggests uptake of the FODIKI methodology to the level of *effort.*

Step 5 + 6: Residents meeting & Final reflection + future perspectives

Context: Before the RWA sent the invitation letter to the local residents, the researcher commented on the draft version, arguing that some concepts and phrases should be worded differently to better fit with the language of the residents. Based on the latest script, the researcher drew up a hypothesis specifying what cognitive and psychological barriers and diffidence, no-relay and institutional failure mechanisms she expected to occur. Just before the residents meeting, she sent this hypothesis to the senior consultant on the condition that he should look at it only after the residents meeting. End November 2017, approximately 60 residents attended the residents meeting. The initiator of the questionnaire had sent the results of the questionnaire to the dike board member, so that the RWA could prepare their response, as they expected a first response after they had handed the results to the dike board member. Among the attendants, several members of local political parties were present, as well as delegates from the municipality.

Observations: After opening the meeting, the chairman gives the floor to the dike board member, who explains why this evening was organised and why the RWA started this process. He approaches the project from a positive standpoint ('yes, the wind turbines can come'), and explains under which conditions people can participate. For some residents, this appears to work like a red rag to a bull. This is reinforced when one of the initiators of the questionnaire hands over the results of this questionnaire to the dike

board member. The attendants would like to hear the RWA's reaction. The dike board member starts with the remark that he noticed that 'the pro-turbine standpoints are at the end of the document'. He does see, however, that 'a lot of time and energy has been put into it'. He also says that it will be not the RWA, but either the province or the municipality – if applicable – that will give the required permits. 'The aim of the RWA is to contribute to energy neutrality and to do this jointly with the citizens'. The dike board member observes that the response rate of the questionnaire was only 53%, and that he would also like to know the opinion of the other 47%. The attending residents react somewhat angrily to this remark. One of the consultants then takes the floor and compliments the residents on finding out the advantages and disadvantages of wind turbines. He says that in the meantime more has become known, and that he notices the passion of the residents to stand up for their interests. He argues that one should only conduct a survey if there is a concrete plan for placing one or more wind turbines. Some attending residents become upset and want the RWA to completely abandon the idea of wind turbines because the 'plans'/ideas of the RWA negatively impact their residential enjoyment. Other attendants protest: 'It seems that the RWA is unwilling to accept the survey, despite the promises concerning support. You simply should not ridicule the questionnaire'. The chairman calls for order and poses some questions to the expert in the field of sustainability, focusing on the procedures. With this, he cools down the atmosphere. A representative of a political party indicates that he is in favour of sustainability but has not yet decided which form would be desirable for the municipality. He states, 'I am happy with the working method of the RWA, and that should also be said during this meeting'. Other pro-turbine residents express themselves by rejecting the design of the questionnaire and emphasising that it was distributed only to a selected group of people. In the remainder of the evening, the chairman of the day gives a local initiator for an energy cooperation the opportunity to introduce himself and their plans. The dike board member closes the evening, expressing that he is happy with this large turnout and that he feels that the subject is very much alive. At the end of the meeting, the senior consultant communicates directly with residents. Afterwards, the senior consultant says to the researcher that 'I tried to use wording that fits with the residents and their felt emotions'.

Aftermath: Some weeks later, the senior consultant, the expert in the field of sustainability, and the researcher reflect on the residents meeting. First, the senior consultant and expert reflect on their own observations of the residents meeting. Thereafter, the researcher expresses that she felt that the shared information of the dike board member and consultant were not well-tuned. The senior consultant states that the dike board member told a different and longer story than originally was agreed, and that he therefore had to adjust his own message on the spot. The original plan was that the consultant would give a brief review of the process that had taken place over the past eighteen months, but he did not have the time to do so. The researcher says that during the meeting, based on the questions, it became clear that the residents had a different perception of the followed process, and that this appeared to lead to some mutual irritation. The researcher also observed that the dike board member and the consultant both reacted defensively to the results of the questionnaire. The researcher describes who were sender and receiver in the different stages of the meeting. Concerning the questionnaires, the initiators of the questionnaires were the sender, and the RWA the receiver. The RWA gave comments on the shared knowledge, indicating

that the held questionnaire did not fit the need of the RWA, as in the RWA's point of view support can only be measured when a concrete plan is developed. The consultant responds that he tried to intervene by phrasing the information differently, but failed. The researcher explains that the consultant experienced a psychological barrier, as the information shared by the residents did not fit with his understanding of the real world. The consultant and expert are keen to learn from the researcher how she applies her framework. The researcher explains what barriers and failure mechanisms occurred during the residents meeting. She points out occasions where the residents felt that they could not trust the RWA, meaning that a precondition was lacking. The process, taken by the RWA conflicted with the process desired by the residents, as they wanted the RWA to stop the feasibility study on wind turbines at this specific location. This led several times to psychological barriers, as the residents challenged or straight-out rejected the RWA's point of view, or they stopped listening. Finally, she saw cognitive barriers, when the dike board member and the consultant used wording that did not fit with the language of the residents. In some cases, the residents asked clarifying questions, in an attempt to mitigate these barriers. The expert and consultant react enthusiastically to the researcher's analysis, and start reflecting themselves in the mentioned barriers and failure mechanisms.

After this reflection, the consultant and researcher contact each other several times. The senior consultant tells how he is using the gained insights in his daily work. He expresses that he is still using elements of the framework while preparing for meetings, but needs more resources and a sparring partner within the RWA. 'Time', he states, 'is still a limiting factor to design a process for successful knowledge transfer and uptake, as I have many projects to work on at once'.

Reflection: The consultant understood the FODIKI methodology, but indicates that as time is the constraining factor, he cannot adopt a new way of working, which suggested the *institutional restrictions* failure mechanism. During both meetings, the senior consultant showed *cognition* of the different FODIKI elements, such as preconditions, potential barriers and failure mechanisms, and started using them.

During this intervision trajectory, the researcher and the consultant had a master-apprenticeship relation, although not as intensive as in the GoWa project. Here, the master could not intervene real-time in the residents meeting, and the researcher and the consultant had limited meetings to share the FODIKI methodology. Still, our analysis of four situations shows that the six-step approach that we designed helped in the uptake of the FODIKI methodology by the two consultants. They expressed the importance of careful knowledge transfer and uptake several times in the consultation meetings and reflection. The senior consultant tried to change his way of working, but lacked practical tools and, above all, time. The consultant's efforts to put the FODIKI methodology in practice, while preparing the residents meeting, suggests the uptake of the FODIKI methodology to the level of *effort*.

Episode 3: Programme team Dike Reinforcement: raising awareness

The Programme Team Dike reinforcement had within the RWA Rivierenland a directing role for all dike reinforcement projects. The Programme Team was interested to learn

more of her experiences gained at the KIS- case and GoWa case. The researcher wanted to raise awareness for efficient knowledge transfer and uptake, as she believed this could benefit the DFPP projects. She conducted an intervision trajectory with three team members of the Programme Team Dike Reinforcement, comprising these four steps:

(1) Presentation during one of their informal sessions;
(2) Consultation meetings with three members of Programme Team;
(3) Bilateral consultation with one member of the Programme Team;
(4) Questionnaire for the RWA 'Dike Workers' and the researcher will reflect on the results, based on the FODIKI methodology and provide practical tooling for future steps.

As we will show, the researcher had to make more effort to convince all team members of the necessity of knowledge transfer and uptake with the FODIKI methodology. The researcher also learned to adapt the message to the receivers' needs.

Step 1: Presentation during the informal session in June 2017

Context: The Dike Strengthening Programme Team regularly had informal sessions, where a wide variety of topics was discussed. The Programme manager invited the researcher to present her PhD research to explore the added value for the RWA to Dike Strengthening Programme Team.

Observations: The Programme manager opens the meeting and gives the floor to the researcher. She first starts collecting the ideas of the team members on knowledge transfer and uptake and writes them on a black board. All team members actively share their ideas, resulting in a wide variety of terms. The researcher then continues and indicates what she – scientifically speaking – means with these concepts. She illustrates how knowledge transfer took place at the pilot testing of two innovative techniques at the dike reinforcement of Kinderdijk- Schoonhovenseveer (Chapter 3, thread C1-MIP and C1-EC). She expresses the importance of trust and the importance of identifying each other's knowledge need. The researcher continues explaining her role in the dike reinforcement Gorinchem-Waardenburg and reflects on the intensive community engagement approach. She stresses the need for a 'standard' RWA presentation that clearly illustrates the necessity for the dike reinforcement, that fits the language of the residents. After her presentation, team members have a lively discussion about the distinction between information and knowledge. The team members tell each other how important it is to carefully think about how the knowledge and experiences gained in one project can be transferred to other, sometimes still future projects. The attendants agree that knowledge management is important, and hence a priority in their annual plan, even though, as one of the members explains, they have no ideas on how to stimulate it. Several members express that their communities of practice are ineffective, and lose their strength, as only few colleagues attend. Unfortunately, several programme team members leave early, which means that there is limited time to discuss the added value of the researcher for the dike strengthening programme within the RWA.

After these team members have left, the programme manager asks what the researcher would recommend focussing on to enhance the knowledge transfer and uptake between the current projects. The researcher emphasises that awareness that knowledge transfer

is crucial, is an important first step. Also, she says, while developing a process design for a meeting, little attention is given to the message and the way this is of interest (N) for the receivers. People seem to have (or take) insufficient time for this preparation. She observes that within the RWA, professionals are afraid to be judged. There is also, as she stresses, not one single medium to effectively transfer knowledge, but a combination of several options, one being the communities of practice. She also points out that the reflection document of GoWa's tender procedure (cf. chapter 4, thread IX) contains important points of attention, but that she suspects that no one has read the document, except those present at the reflection meeting. This is confirmed by several team members. One team member says that he is looking for input to develop a list with tips and tops for sharing information. The researcher responds that there is no 'one size fits all', but that the FODIKI methodology provides insights in the most relevant variables in sharing knowledge. The team member persists in having practical tools for the project teams. Next, the team members jointly share experiences indicating that their colleagues are too focussed on their own projects and lack time to share information. They also indicate that when lunch presentations are held, the presenter focusses too much on project specific details, meaning that the information relevant for other project teams is not properly shared, such that the attendants are unable to use the shared knowledge in their own work. The team members also

Reflection: The researcher acted as sender during this session, and the Programme Team members as receiver. In the meeting there was trust, as they spoke open and transparently. Some programme team members asked clarifying questions, indicating the occurrence of cognitive barriers. The team members expressed the importance of knowledge transfer and uptake, as this is a priority in their annual plan. In the joint discussion the programme team members gave feedback on the presented methodology. This suggests uptake of the FODIKI methodology to the level of *cognition*.

Step 2: Consultation meeting with three members of Programme Team – December 2017

Context: Approximately six months later, three members of the Programme Team and the researcher further discussed what her added value could be for the Programme Team and the RWA in general.

Observations: At the start of the meeting, the team members share the latest developments in the projects, and what they are currently working on. One Programme Team member indicates that he is organizing a day for the internal RWA colleagues to share relevant insights of the projects. He is also working on a model to share knowledge via a platform, such as intranet. The researcher tells more about the recent developments of GoWa, and shares some observations and diagnoses she made after the start of the alliance and the held residents meetings. Then they openly discuss on how the researcher could help the programme team in stimulating knowledge transfer and uptake across projects. The researcher proposes to conduct a survey to learn more on how the colleagues of this RWA, who are working on dike reinforcement projects (so-called 'dike workers') think about knowledge transfer and uptake, and where they collect their knowledge from. This survey, she explains, can then provide input for possible follow-up actions by the Programme Team, and helps to formulate specific actions in the annual plan. One of the Programme Team members is not convinced of the added

value of the survey, as he wants to have practical tools for the project teams. This team member is result-oriented and wants the solution right away. The researcher fails to convince him that there is not one panacea for knowledge transfer. The programme team members also mention that some organisational changes will take place in the first months of 2018. They suggest that it would be worthwhile for the researcher to connect with the involved people. At the end of the meeting they agree that the researcher will make a proposal for the programme team.

Aftermath: In bilateral meetings, two Programme Team members tell the researcher that they refer to the FODIKI methodology, and the gained insights of the researcher in the KIS and GoWa case. One Programme Team member also starts to put the concepts into practice.

Reflection: There was mutual trust between the attendants, as they spoke open and transparently. We saw that the FODIKI methodology did not match the quick fix need of one Programme Team member. The researcher tried to intervene on several occasions in the meeting, to adapt her message to the need of this Programme Team member. Despite the researcher's effort, she was unable to redirect the conversation. We saw a *psychological* barrier, as one programme team member expressed that he needed to change his view and way-of-working and was not yet prepared to do so. The uptake of the FODIKI methodology reached the level of *reference*, as two Programme Team members refer to this methodology.

Step 3: Bilateral consultation with one of the Programme team members – April 2018

Context: At the beginning of 2018, the researcher captured GoWa's participation process in a poster for an international competition, part of her secondment at the DFPP Programme Board. Especially for this occasion, she hired a designer to make the necessary visualizations. The programme team member who in the previous step had strong reservations about the approach of the researcher, was intrigued with two of these visualizations, and wanted to discuss the idea behind them with the researcher. After this meeting, the two discussed their work on knowledge management on a regular basis, to jointly benefit from the gained insights. Here, we focus on this first bilateral consultation. The main reason for this bilateral consultation was the visualization of the hourglass (see Figure 4.3 on page 53), where the researcher pointed out the intensive community engagement approach, and now this differed from previous projects.

Observations: The Programme Team member asks the researcher to explain the underlying ideas of the hourglass. The researcher explains that in earlier projects the project team would only communicate with the public after they already made a draft design for the dike, whereas GoWa chose to involve the public before any sketches were made on the re-design of the dike, turning the hour glass upside down. She mentions that the GoWa project team wanted to collect the public's vision on this dike, and where possible, incorporate this in the design of the dike. She tells that the Dutch Flood Protection Programme (DFPP) considers GoWa as an example for the most intensive community engagement approach. The researcher then explains how the DFPP tries to share knowledge from one project to another, and how in her role at the DFPP Programme Board, she is advising and brokering between multiple project and technical research projects. The researcher shares how the FODIKI methodology helps to advise

and support projects. She again explains the FODIKI concepts, while referring to current DFPP projects. The researcher asks questions to further identify the knowledge need of the Programme Team member. He then explains that he is working on a map, that describes the different approaches of the current dike strengthening projects within the RWA. He asks the opinion of the researcher. The researcher responds while using the FODIKI concepts and highlights the needs of the potential receivers. She explains that the chosen colouring could lead to cognitive barriers, and relates this to her experiences at the GoWa project. They discuss potential actions within the RWA to raise awareness to share knowledge, such as communities of practices and an annual dike workers day. The team member expresses at the end of the meeting, that he sees the added value of the FODIKI methodology.

Aftermath: In subsequent meetings, the Programme Team member shows *cognition* for the FODIKI concepts, such as sender, receiver, knowledge needs and trust, and tried to reason while using these concepts.

Reflection: While discussion a visualization of the community engagement approach, the researcher (S) gained the trust (T) of the Programme Team member (R), after which she shared the FODIKI methodology (K). The Programme Team member believed that K will help him perform better within his work, such that the preconditions were met.

Throughout the meeting, the researcher asked more in-depth questions, to better understand the need of the Programme Team member. She was then able to fit her message to this need. At the end of the meeting, we saw that the Programme Team member Throughout the meeting, we saw that the Programme Team member showed *cognition* of the methodology and in subsequent meeting, he started applying the concepts himself, suggesting the uptake of the FODIKI methodology to the level of effort.

Step 4: Questionnaire for the RWA 'Dike Workers' – June 2018

Context: After a bilateral meeting with another Programme Team member and the researcher, the former decided that a questionnaire, as proposed by the researcher in December 2017, would be a good idea to get an impression on where the RWA dike workers gain their knowledge from. They jointly decided that some questions would focus on the Programme Team and their effort in sharing knowledge. After some re-iteration of the questions, the researcher developed an online survey. The questionnaire was sent to 100 dike workers employed by the RWA. Before the summer break, she collected the responses from the RWA dike workers. 46 colleagues (response rate 45%) responded on the questionnaire. After the summer, the researcher analysed the results.

Observations: The researcher presents the results of the questionnaire and discusses them with the Programme Team member. She points out that more than 30% of the respondents do not know where to acquire new knowledge from their own discipline. They often search for knowledge and information via the external network. It seems that the RWA is an informal organisation, because, as she highlights, people often fall back on experienced employees. The respondents also indicate that knowledge is informally shared, but not always formally documented. In a general sense, the respondents ask for more direction and control from the dike reinforcement programme. 22% of the respondents are not aware of developments in the RWA's projects. The researcher also

presents the conclusions in FODIKI terms. The team member recognizes the results and decides to discuss the results with the Programme Team Dike Reinforcement. The researcher asks if the Programme Team member can share his observations, using FODIKI concepts, with the researcher after he transferred the knowledge to his team members. He agrees to that.

Aftermath: After this bilateral meeting, the researcher makes a few changes to the conclusions, predominantly in the wording, such that they fit the language of the RWA. At the end of November 2018, in absence of the researcher, the Programme Team member presents the results of the questionnaire during a meeting with the Programme Team and discusses them. After this meeting, he gives comments and advice to the researcher. As he explains the reaction of this team, he uses the FODIKI concepts, such as need and trust. First, he says that his colleagues recognized the results of the questionnaire. As the questionnaire showed that some respondents are unaware where to gain new knowledge, the team members related this outcome to the respondent group, where 50% did and 50% did not work within the dike reinforcement programme. The Programme Team members also ask whether some results were really striking, or that it could be related to other developments. In this way, they played down some results, which suggest the occurrence of a failure mechanism. The researcher explained that she thinks it is an *institutional restrictions* failure mechanism, as it required a different way of working. They discuss the meeting further in terms of barriers and failure mechanism. The results of the survey on knowledge transfer are included in the 2019 programme plan and the results are also put on the agenda of the Programme Council. One of the actions is to make the dike workers more aware of the role of the Programme Team Dike Reinforcement.

Reflection: The Programme Team member was able to reflect on the held meeting while using the FODIKI concepts. This suggests uptake of the FODIKI methodology to the level of *effort*.

Overall reflection on an organizational level

The three episodes with different RWA colleagues provide evidence for the effectiveness of FODIKI knowledge transfer. In this section, the researcher used the FODIKI methodology to reflect on the uptake of the FODIKI methodology. To create cognition and reference to the FODIKI methodology, those involved must also understand that there is a reason for this. This is in line with organizational change management (Lewin, 1940), where a motivation is first needed to be able to change. In all three episodes the researcher attempted to give the RWA employees a language so that they can talk about knowledge transfer and uptake. Aim was to investigate whether the FODIKI methodology can be transferred to RWA stakeholders, such that they can use it for knowledge transfer and uptake. First step was to create awareness to consider knowledge transfer and uptake more consciously.

In some occasions, the researcher encountered some resistance from the receivers, as the message did not meet their needs. During the episodes we mitigated *cognitive* barriers, as the receivers often asked clarifying questions. We also saw *psychological* barriers arise, as people were sometimes unable to adapt to a new way of working.

After a while, the researcher made the link to Lewin's 3-Stage Model of Change (1952 in Elrod II & Tippett, 2002) in a successful change project: (1) to unfreeze the current level, (2) to change to the new level and to freeze this new level again (3). In retrospect, the researcher tried to change standing practices, which in the literature is also called organisational change management (e.g. Todnem By, 2005). Time and communication are two important success factors in changing standing practices. The sustainability consultant had already indicated that he lacked time to thoroughly prepare for knowledge interaction moments.

In the intervision trajectory, the researcher has succeeded in creating *cognition* for the FODIKI methodology and thus a need. The serious game helped to create awareness, so that the researcher articulated what tacit knowledge is for the RWA employees. By telling stories and experiences, the researcher tried to show them that they have a need and that knowledge management is crucial within this discipline (see also chapter 1). Sustainability itself is a subject that is becoming more important for the RWA.

In chapter 3 we already saw that the RWA is a learning organisation, and in the years to come, the RWA will likely have to adapt to new conditions, and therefore needs to be a learning organisation. RWAs are also high reliability organizations (Cox *et al.*, 2006; Termeer, 2009; Roe & Van Eeten, 2001). This means that RWAs face the paradox that 'they have to function reliably but are constantly confronted with unexpected events. If they do not function reliably, they can cause severe harm' (Termeer, 2009). In the RWA's context, 'reliability is not replaceable' (Roe and Van Eeten, 2001), RWA staff must work within the boundaries of this type of organizations. Sharing knowledge within the organization, and especially between project teams is important, as projects face comparable challenges. We believe that knowledge brokers can play an important intermediary role. Especially when these knowledge brokers work in different teams in the organizations, these organizations are more able to shift individuals from team to team to react to changing environmental conditions (Easterby-Smith & Lyles, 2011). A learning organisation sometimes leads to changes in organisational practices and structures. This can partly be seen in how the Dike Strengthening programme team tries to fulfil its role within the organisation, and its team members also fulfil other roles within the RWA.

The Dike Strengthening Programme Team oversees the central management of the RWA's dike reinforcement task. The team members are aware that, given the considerable task around the dikes, the involved members should continuously learn about the possible approach and the associated organisational structure. They are in the middle of a learning process. Since the start of the DFPP, the RWA Rivierenland made some organisational changes, partially due to the retirement of two experiences professionals in the field of dike reinforcement. Their positions were filled by other RWA colleagues. With these changes, the RWA hoped to be well prepared for the necessary dike reinforcement projects that will commence in future years. The Programme Team will increasingly have to deal with the differences between the current dike reinforcement projects and the desired coordination with overarching project partners, such as provinces, municipalities and interest groups. For them it is important to learn while experiencing and adapt if necessary. The episodes showed that the FODIKI methodology is most likely to help the Programme Team to enhance the knowledge transfer and uptake both within teams and between teams, as we already saw in chapter 3 - 5.

Working in a changing environment and organization also requires that the employees are involved in these changes, and sufficiently understand why these changes are necessary. In the level of uptake (U), we saw that several RWA employees have *cognition* and refer to the insights gained. In some cases, they have tried to apply it (*reference*). We also see that awareness of the importance good knowledge management has led to more explicit reflection on one's own actions (*effort*). The researcher did not intervene in the organizational change management, but the intervision trajectories and the received feedback of the involved RWA employee in the intervision trajectories suggest that she has helped to generate insights for improving the knowledge transfer and uptake to remain a learning organisation as RWA. To allow more RWA employees to use the FODIKI methodology up to the uptake level of *effort*, the researcher or others must transfer this knowledge on the level of individuals. The Programme Team members can use the gained insights to perform their roles as catalysts and synthesizers better with the FODIKI methodology in mind.

6.3 Transferability within the scope of a programme

We will now focus on the transferability of the concepts of the FODIKI methodology within the wider scope of the Dutch Flood Protection Programme (DFPP), as the GoWa project is part of the DFPP. Since 2012, the researcher has been seconded to the DFPP Programme Board for one or two days per week, and has fulfilled several roles here, including that of liaison officer between the TRPs and innovation projects and the dike reinforcement projects. She is currently (May 2019) working on the recalibration of the DFPP Knowledge and Innovation Programme. The researcher tried to raise awareness for the concept of *knowledge strategy*, which was one of the main recommendations of the Deltares study (2016), in which she was involved. This means that that K being transferred was not the FODIKI methodology as described in chapter 2, but the elements of the knowledge strategy. We will describe the findings of the researcher in her role as advisor of the DFPP Programme Board.

The DFPP comprises more than 200 projects, that together should bring more than 1800 km of primary flood defences up to safety standards by 2050. It is a cooperation between Rijkswaterstaat and the 21 RWAs. The DFPP Programme Board is (first and foremost) responsible for setting up and directing the process of programming and budgeting, granting subsidies and reporting/accounting. In addition, the DFPP Programme Board facilitates the RWAs through so-called *guidance teams* in developing and sharing knowledge within the DFPP. In terms of the Principal Agent theory (Guston, 1996), the DFPP Programme Board is the agent, who reports to its principal, the DFPP Steering Committee (DFPP SC), which consists of executives from Rijkswaterstaat and the RWAs. The DFPP SC falls under the jurisdiction of the Minister of Infrastructure and Water Management. The DFPP Programme Board is led by two directors, and has a staff of 40 highly skilled professionals from the national government and from the RWAs. These professionals often have a fulltime secondment for a set period of 1,5 or 3 years, and have project experience gained at their mother organisations. The average time of their secondment is around 2 years, meaning that there is a turnover of 50% in the workforce.

From the onset, the DFPP Programme Board believes that state-of-the-art knowledge and innovations are required to realise the task within time and budget (DFPP, 2012).

On average, the development time of innovations is more than 15 years. For the current DFPP, this development time is too long and should be at least halved. Enhancing the knowledge transfer should therefore save valuable time at programme scope. The DFPP Programme Board foresees that more than 100 projects at different RWAs will run simultaneously in 2021, making interim learning from each other even more important (to achieve the programme objectives). The challenge, however, is that the projects are being carried out concurrently in several RWAs, while – as we saw in section 6.2 – sharing knowledge between several projects within one RWA already appears to be difficult. In addition, the DFPP Programme Board is not their direct supervisor and hence cannot enforce the exchange. While we discussed organizational learning in the previous section, we focus here on both organizational and interorganizational learning.

In the first years of the DFPP, the DFPP Programme Board devoted a great deal of attention to initiating innovations by (DFPP, 2012):

1. *Smart programming*: balancing work load over time, stimulating innovations and utilising knowledge and experience from other projects and policy fields;
2. *Increasing production*: preventing delays in projects by leaving space for innovations and by improving cooperation between all actors;
3. *Reduction of costs per km*: applying new methods and techniques and using good practices.

The DFPP Programme Board examined the opportunities when developing the first *DFPP knowledge and innovation strategy* (DFPP, 2012). In 2013, the DFPP Programme Board carried out an assessment of opportunities (DFPP, 2013) to see which innovations helped attain the programme objectives. Most of the DFPP projects focus on designing the dikes to resist the two most common dike failure mechanisms: macro stability and piping. Measures to counteract these dike failure mechanisms typically are expensive and/or require a lot of space. Therefore, innovations aimed at these dike failure mechanisms would probably be very effective. Based on this assessment, the DFPP Programme Board asked all parties involved (contracting companies, consultancy firms, governments, research institutes, universities, etc.) to propose potential innovations. The DFPP Programme Board assessed these proposals and ranked them according to their impact on the programme or project, see Figure 6.1. The innovations on the right (types II and III) were considered particularly important to achieve the programme objectives.

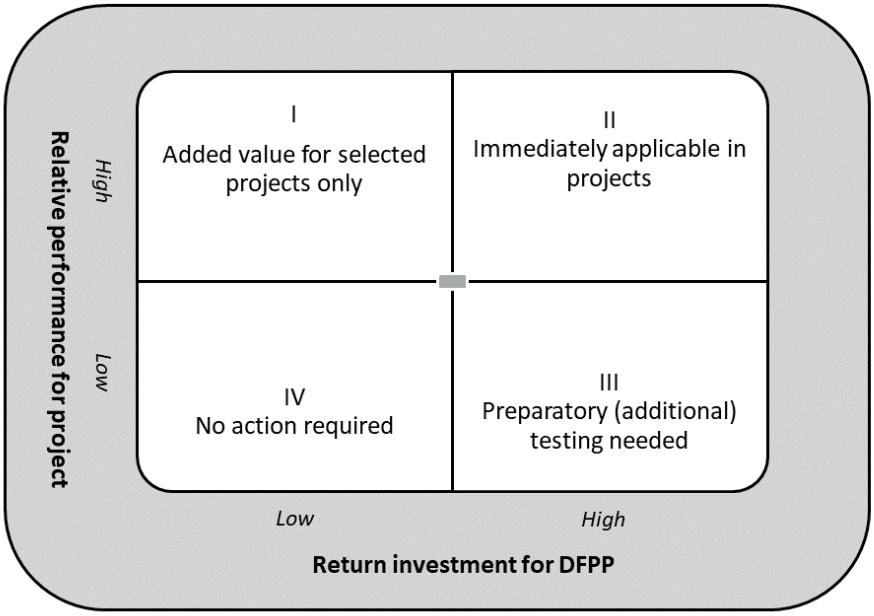


Figure 6.1 Ranking innovations in the Dutch Flood Protection Programme (Jorissen *et al.*, 2016)

Type III innovations still require further development and testing, but are important for the performance of the programme because of their potential impact. For these type III innovations, the DFPP Programme Board initiated specific technical research and test projects (TRPs). In the period 2013-2018, a total of seven TRPs were started, of which four TRPs started in 2013/2014. The TRPs were staffed with professionals from relevant RWAs, knowledge institutes and the private sector. Each TRP had their TRP Steering Group that consisted of either dike reeves or board members from the involved RWAs. On the administrative level, each TRP formed a sounding board group with professionals of the involved RWAs. TRPs run for a finite period of time, after which the project team members return to their regular job position. The DFPP Programme Board intended that the TRPs disseminate their knowledge and innovation broadly, such that DFPP projects will use it. This meant that the TRPs are not only the producer of knowledge but also (in FODIKI terms) the sender of this knowledge. In this way, the knowledge is only transferred to the current DFPP projects. By sharing the knowledge with the DFPP Programme Board members, these members can make the knowledge available for future projects, so-called passive knowledge acquisition.

For the programme scope, we conducted a different type of research, as we did not operate in an action research setting. The researcher could observe during meetings, but was unable to plan for these meetings. We therefore describe the activities of the researcher at a higher aggregation level to show the developments on DFPP level since 2012 until end of 2018. In the remainder of this section, we focus on the question, whether the research team (Deltares, 2016) succeeded in sharing the concept of the

knowledge strategy to the DFPP Programme Board and TRPs. For this, we describe (1) the original question of the DFPP Programme Board to the research team, (2) the conclusions and recommendations of the Deltares study (2016), and (3) how the DFPP Programme Board used the findings in the subsequent period.

In 2015, some members of the DFPP Programme Board became aware that the TRPs ending in 2017 should by then have transferred 'their' knowledge to the new and current DFPP projects. These four TRP project teams should share knowledge in such a way that future projects would also benefit from it. The DFPP Programme Board therefore commissioned a study to Deltares, TU Delft and Erasmus University to investigate how four TRPs share the gained knowledge in DFPP projects, the DFPP programme and (national) policy. The research team (including the researcher) examined the four TRPs at that time in more detail (Deltares, 2016). While performing this study, the research team undertook an action research approach, as the team shared their preliminary findings to enhance the learning process, with two receivers, namely the DFPP Programme Board and the current TRPs.

We report their findings here, using FODIKI terminology, although the research team did not *per se* think in FODIKI terms at that time. The research team conceptualized the DFPP Programme Board as a boundary organisation (Guston, 2001), where boundary spanning behaviour plays an important role in collecting relevant information and allowing it to absorb, enabling organisations and projects to adapt to the changing environment (Van Meerkerk & Edelenbos, 2018; Tushman & Scanlan, 1981; Rosenkopf & Nerkar, 2001). In addition the research team also actively looked for boundary spanners, who are 'people who proactively scan the organizational environment, employ activities to cross organizational or institutional boundaries, generate and mediate the information flow and coordinate between their 'home' organization or organizational unit and its environment and connect processes and actors across these boundaries' (Meerkerk and Edelenbos, 2018). These boundary spanners play a role in the sense making and framing of activities (Carlile, 2002; Williams, 2012).

Within TRPs, the teams produced different types of knowledge. They developed methodological and processual knowledge and also 'best practices' for DFPP projects. In terms of Sarewitz & Pielke (2007), most TRPs could be characterised as 'science-driven', whereas others could be characterised as 'demand-driven'. The TRPs also differed in their focus: some TRPs focused on specific dike failure mechanisms, with an aim to develop product innovations and reduce the scope for this specific dike failure mechanisms, whereas other TRPs focussed on developing a series of preferred alternatives for a specific area, e.g., TRP Wadden Sea.

The Deltares (2016) study highlighted three categories of receivers (R), with a TRP being the sender (S):

1. *The DFPP Programme Board*: Here, the involved TRPs shared the developed knowledge with the DFPP Programme Board, as they believed that the DFPP Programme Board had the responsibility to share the knowledge to other potential receivers, in category 2 and 3. The DFPP Programme Board did not agree, as the TRPs original assignment stated that during the project duration the TRPs should transfer the knowledge to potential end users. That this mismatch of expectations was not

resolved earlier, suggests a lack of metacommunication between the involved TRP project teams, and the DFPP Programme Board, as the mismatch in expectations was not addressed.

2. *The national statutory technical safety standards*: the involved TRPs believed that when the gained knowledge was adopted in the national guidelines, then the DFPP projects would use it. However, considering that it takes more than five years before these guidelines are changed, in those years the DFPP projects were unable to use it, unless the knowledge was sent to them. The TRPs focussing on the national standards as receiver were science-driven, and they made assumptions on the needs of DFPP projects. Here too, the mismatch of expectations was not resolved earlier, suggesting a lack of metacommunication between the involved TRP project teams and the DFPP Programme Board.
3. *The DFPP projects*: the TRPs aimed to provide practical guidelines for the DFPP project teams that would enable them to directly use the developed knowledge. The TRP often translated the developed project specific knowledge towards nationwide applicability. In other words, the TRP saw not only them as producer but also as sender. Two TRPs with a focus on this receiver were demand-driven, as they knew the needs (N) of several DFPP projects.

The *major findings* reported in the Deltares (2016) study were:

- TRPs are predominantly producers and not senders. Some TRPs believe that actively transferring the results is not necessary as 'knowledge will sell itself'. When the knowledge is *relevant* (in FODIKI terms: when the knowledge K fits the needs), others will use it. The TRPs often also did not (yet) identify the potential receivers of the knowledge. The involved professionals did not actively share the gained knowledge within their mother organisations.
- At the time of the study, the TRPs were still producing knowledge, and therefore did not share the knowledge to potential users. Even though the TRP research teams had developed the knowledge in a thorough way, it did not automatically mean that the knowledge was *reliable* (in terms of Cash *et al.* (2003), (in FODIKI terms: when the receivers trust (T) this knowledge).
- In most cases, the transferred knowledge was not *salient* for the receivers (in FODIKI terms: knowledge K did not match the need of the receivers). Even 'demand-driven' TRPs who *did* take the knowledge needs of the receivers into account, still saw themselves predominantly as producers. They published reports but did not actively send them to receivers. The metacommunication was unilateral, through newsletters, where the reports were mentioned or were placed on the TRP websites, such that potential users can download it.

  Within the most sophisticated TRP, the produced knowledge was applied in real DFPP dike strengthening projects, such as the application of 'Actual Strength' in a DFPP dike strengthening project. This DFPP project worked within a time window with the DFPP Programme Board. The project manager defined stage-gate moments, to be able to adopt the produced knowledge from the Actual Strength study in time within the exploratory phase. Because the TRP research team worked in close cooperation with the project team, they had a shared lexicon, and the project team could implement a different way of working when needed, such that barriers did

not occur. The TRP research team had to deliver the produced knowledge in time at certain stages, to be able to implement the knowledge within the DFPP project. When the knowledge was shared too late, the project manager was unable to adopt the knowledge (in FODIKI terms: the occurrence of an institutional failure mechanism).

- In some cases, information was lacking to what extent the produced knowledge would contribute to the faster, better and cheaper execution of dike reinforcements (DFPP Programme objectives). The DFPP Programme Board was unable to see the benefits of the produced knowledge (in FODIKI terms: the shared knowledge did not fit the need of the receiver). We saw examples where the 'know how' (already applicable knowledge) was tailored for one RWA particular. The DFPP Programme Board saw this as a knowledge need of only a small target group, and therefore did not take additional actions to share the knowledge. The DFPP Programme Board did request information how this knowledge helped to contribute to the DFPP Programme objectives.

The recommendations of the Deltares (2016) study focussed on the two receivers: the TRPs and the DFPP Programme Board, where the Deltares research team was the sender:

TRPs

- The TRPs should make clear arrangements on who transfers which knowledge. The TRP team members should fulfil an ambassador's role towards their own mother organization to share the developed knowledge. In addition, these mother organisations should also create incentives that will stimulate the TRP members to share this knowledge.
- Continuity in knowledge workers: 'Within the TRPs, the composition of the knowledge workers should remain as stable as possible. This advice applies both to new TRPs and current TRPs'. Excessive staff turnover in a knowledge-intensive process has a demoralising effect on others and slows down the pace of exploration. Each TRP should have boundary spanners, who must simultaneously be networkers, strategic connectors, entrepreneurs and politically sensitive. These boundary spanners also play an active role in sharing *reliable* knowledge, as, (in FODIKI terms), trust both in sender and transferred knowledge plays an important role.
- Current and new TRPS should have a differentiated *knowledge strategy*, based on three components: (1) an assessment of the end users, their specific needs and their knowledge networks, (2) the stage of development of the TRP and (3) the readiness level of the generated knowledge. These components can change over time, leading to the need for regular readjustment of the strategy deployed.

DFPP Programme Board

- The DFPP Programme Board should make clear up-front agreements on how the TRPs should share their knowledge and what the TRPs should transfer to the DFPP Programme Board.
- Continuity in knowledge workers: Here too, excessive staff turnover in a knowledge-intensive process has a demoralising effect on others. By consequence, knowledge can be lost, when members leave. The research team advises that the DFPP

Programme Board should have more members who fulfil a 'boundary spanning' role.
- In the progress meetings with the TRPs, the DFPP Programme Board members should regularly discuss the *knowledge strategy,* as its components changes over time, and facilitate the knowledge sharing where possible, given the DFPP communication tools.

The results of the study were first presented and discussed in a session with representatives from both the DFPP Programme Board and the TRPs. In that session, the TRP project teams indicated that the TRPs yielded a great deal of tacit knowledge, which had to be transferred in a different manner. The research team also saw that the expectations between actors often remained implicit. The researcher presented the *knowledge strategy* at an annual TRP day, where she handed the results to executives from the TRPs and the DFPP Programme Board. These executives expressed the importance of knowledge uptake of the produced TRP knowledge, and said that the TRPs would made additional effort.

In the subsequent year, all new TRPs included a section on the knowledge strategy in their Plan of Approach. This suggests the uptake of the knowledge strategy by the TRPs to at least the level of *reference*. The four TRPs, that were the object of the Deltares study rewrote their communication plan, emphasising the intended receivers and their potential needs. Most TRPs used different media to share their knowledge. More than ever, TRPs visited current DFPP project teams to discuss whether the produced TRP knowledge could be used within their project scope. This suggest the uptake of the *knowledge strategy* by the TRPs to the level of *effort*.

The research team proposed to the DFPP Programme Board to organise a follow-up session to explicitly address these expectations, in who transfers which knowledge. The DFPP Programme Board did not follow up on this proposal, but regularly referred to the report, and the concept of knowledge strategy, suggesting uptake to the level of *reference*. The DFPP Programme Board initiated other processes where the concept of knowledge strategy was relevant and influenced the outcomes.

Updating the DFPP Knowledge and Innovation Strategy

In 2017, the DFPP Programme Board initiated a process to update the Knowledge and Innovation Strategy. They held several meetings to identify the needs of the receivers. The attendants commented on the effectiveness of the knowledge and innovation process, and suggestions to further improve this process, which resulted in an updated knowledge and innovation strategy called 'Innovation Next Level'. The main findings (DFPP, 2017c) were:

- *Knowledge must 'flow'*. Additional effort is needed to share knowledge. The participants requested that the DFPP Programme Board would provide overviews of the state-of-the-art knowledge and latest state of affairs regarding innovations, and also specify which criteria the DFPP would use in the acceptance of innovations. They advised that the DFPP Programme Board should work closely together with the national knowledge agendas to stimulate interorganisational learning. In their

feedback, the attendants addressed the availability and accessibility of knowledge. The attendants also said that the knowledge should be relevant for the end users (in FODIKI terms: the sender should consider the needs to mitigate barriers and failure mechanisms).

- *Aftersales*. 'When applying innovations, there is no firm guarantee that they will function optimally and will continue to function throughout their expected lifespan. The functionality of the technique must be demonstrated at regular intervals. This will increase confidence in the application of the technique, and long-term monitoring can be a useful tool in this respect'. RWAs are more willing to use innovations when the risk of the innovations not working is carried on the Programme level. If an innovation does not work, the involved RWA can reinforce this specific dike section with traditional techniques at the expense of the DFPP. In FODIKI terms, this suggests a potential *institutional* failure mechanism, but as the DFPP Programme Board already included this risk in the subsidy scheme, this failure mechanism was mitigated.
- *Knowledge sharing*. 'The respondents indicated that the available knowledge has not yet been widely disseminated. Those involved are often insufficiently aware of what information is available. Themes such as possible innovations, financing arrangements, other subsidies and , possible contract requirements must be shared more widely. In addition, the process of accepting innovations as mainstream has not yet been sufficiently crystallized and publicized'.

Furthermore, the analysis showed that the benefits of the Knowledge and Innovation Process remained invisible for the executives. Therefore, the DFPP Programme Board developed the so-called Innovation Monitor (DFPP, 2018), which gave more insight in the revenues and outcomes of the investments in the Knowledge and Innovation Process. From the DFPP (2017) study, we saw that the produced knowledge in TRPs was still insufficiently shared between parties. The DFPP Programme Board started to stimulate the implementation of the knowledge strategy and made efforts to share the produced knowledge in TRPs to DFPP Projects. This suggests the uptake of the *knowledge strategy* by the DFPP Programme Board to the level of *effort.*

Re-evaluation of the DFPP Knowledge and Innovation Process

At the start of 2018, the DFPP Steering Committee (DFPP SC) felt that the results of Knowledge and Innovation Process remained unclear for them. They requested a re-evaluation of the uptake of the gained knowledge of the TRPs, and asked whether the TRPs were still effective or that the knowledge and innovation programme needed modifications. Some involved stakeholders indicated that the RWAs and Rijkswaterstaat could work more jointly together in the DFPP, suggesting interorganizational learning. They were increasingly looking to the Programme Board to take greater control of the processes, and to make the use of the knowledge –which has emerged within the TRP – compulsory, via the 'comply or explain' regulation. The DFPP Programme Board led this process by organising a series of meetings, both on administrative and executive level, to identify the added value and characteristics to be preserved. The researcher was part of that team.

During this process, the involved stakeholders expressed that they would like to see the DFPP Programme Board take a more orchestrating role, as the Programme Board has insight in cross-project interests. The Programme Board members also became more aware that their organization can play a stimulating and facilitating role in sharing relevant knowledge from among others TRPs to the DFPP projects, partially because TRPs are finite. The Programme Board requested more insight in the followed protocol on quality management of the developed knowledge, and insight in necessary follow-up steps towards acceptance and implementation of the knowledge in the DFFP projects.

The TRPs also started to share their results to the DFPP SC Members. The TRP Steering groups actively shared knowledge to the DFPP SC members and invited them to the full-scale field-testing of the failure behaviour of sheet piling boards. The full-scale field-testing resulted in direct bookable savings (cost, but also in CO_2 emissions) of approximately 30% on the weight of longitudinal constructions (e.g. sheet piles) and offered the prospect of additional savings for future designs and assessments of these constructions in dikes (DFPP, 2019). In anticipation of the results of the Innovation Monitor, the TRPs and the DFPP Programme Board jointly made a calculation of the potential of the developed TRP knowledge. More than ever, the TRP executives stated that 'the baby must not be thrown out with the bathwater'. They realised that the TRPs must take additional effort in sharing, often situated, knowledge to current and future DFPP project teams to valorise the potential.

The TRP Steering group executives wanted to share the knowledge, but most TRP project teams were less enthusiastic. Being experts and researchers, their main drive was to gain more and more knowledge. Having to actively share knowledge with potential receivers, implied a new role and new ways of working, suggesting the occurrence of *psychological* barriers. Most TRPs also needed more time to disseminate the produced knowledge, and therefore most TRP project teams requested a longer duration of their TRP to prevent a *resources-restrictions* failure mechanism. The DFPP SC has embraced the DFPP Knowledge and Innovation Process, with a stronger emphasis on knowledge uptake from the TRPs. In the documents, the *knowledge strategy* is explicitly mentioned, partially due to the secondment of the researcher and her strong belief that this concept will enhance the knowledge uptake. This suggests the uptake of the *knowledge strategy* to the level of *adoption.*

Presently (May 2019), the DFPP Programme Board is still establishing a new policy, as they are willing to extend the duration of the TRPs, on the condition that the TRPs use most of this time for knowledge sharing. The DFPP Programme Board aims to stimulate the incentives for knowledge sharing with all involved professionals. Often their personal/organisational driver is preserving a good reputation (RWAs) and acquisition (consultancies and knowledge institutes). The DFPP Programme Board wants to create conditions that developed knowledge is actively shared between projects and organisations, while realizing that knowledge transfer takes place between individuals. The DFPP Programme Board also provides backup in sharing situated knowledge and is organising a so-called library where all the documents, videos, factsheets can be placed, such that the DFPP Project teams can search this library for the state-of-the-art knowledge. This suggests the uptake of the knowledge strategy to the level of *adoption* for the DFPP Programme Board colleagues.

Still, even the TRP members who are most willing to share their knowledge have to be made aware of all three barrier types while transferring knowledge: both senders and receivers should have time to present/listen to the knowledge (transmission *barrier*), the knowledge should fit the jargon of the receiver (*cognitive* barrier), and the receiver must be willing to adopt a new way of working (*psychological* barrier). Also, the institutional failure mechanism can occur, when the receiver experiences that procedures (e.g., DFPP procedures) are preventing the receiver from absorbing the knowledge.

Several studies (Deltares, 2016; DFPP, 2017, 2018) have made TRPs and the DFPP Programme Board more aware of the importance of knowledge transfer and uptake. Over the years, the work processes within the DFPP Programme Board have changed, and knowledge management has become more important. The DFPP Programme Board also realised that situated knowledge dissipated because of the high turnover in their staff. Important information about precedent setting in DFPP projects was lost. They are now shifting towards permanent staffing, who behave more like the 'boundary spanners' mentioned in the Deltares (2016) study. To stimulate the interorganizational learning, the FODIKI methodology, the DFPP Programme Board members should use the gained insights to perform their roles as catalysts and synthesizers better with the FODIKI methodology in mind. To reach the uptake level of *implementation*, the methodology must be institutionally anchored on a programme level.

6.4 Conclusions

The fifth research question in this study was whether the FODIKI methodology can be applied successfully by others. To answer this question, we have reflected in this chapter on our attempts to transfer the researcher's working method and its associated terminology to third parties within three scopes.

Within the scope of the GoWa project, the researcher acted as sender in numerous knowledge interaction moments, where she shared the FODIKI methodology with a context manager via a master-apprenticeship relation. This context manager not only appropriated the FODIKI methodology, but also shared this knowledge with his colleagues. Considering that these colleagues started to use the framework, the uptake of the framework within the GoWa project appears to have reached the level of *implementation*.

Within the scope of RWA Rivierenland as organisation, we focussed on raising awareness for the importance of knowledge transfer and uptake. The researcher collaborated with several colleagues within the RWA, and through her efforts, the RWA employees now know that they need to carefully design and manage processes for knowledge transfer and uptake. A number of organisational changes in the RWA took place. Several RWA employees now try to apply elements of the FODIKI framework, which suggest the uptake of the FODIKI methodology to the level of *effort.*

Within the scope of the Dutch Flood Protection Programme, the researcher actively tried to raise awareness for the use of a knowledge strategy that comprised several elements of the FODIKI methodology. After several studies, the DFPP Programme Board did start to stimulate the use of this knowledge strategy, and made efforts to share it with DFPP

projects. The duration of the TRP projects was extended in order to further disseminate the produced knowledge. The uptake of the *knowledge strategy* for the TRPs reached to the level of *effort*, whereas the uptake of the *knowledge strategy* reached the level of *adoption* for the DFPP Programme Board members. To enhance the learning between DFPP projects, the application of the FODIKI methodology still needs to be institutionally anchored on a programme level, through the DFPP Knowledge strategy, to reach the uptake level of *implementation*.

Within all three scopes, we have seen that the involved professionals become aware of the importance of knowledge transfer and uptake. More importantly, we have seen that knowledge transfer takes place through interaction between sender and receiver, where sender and receiver are individuals or small groups. This is consistent with the idea that knowledge is situated, and that knowledge transfer involves knowledge (re)construction by the receiver. We often saw *psychological* barriers, *resources restrictions* failure mechanisms and *institutional restrictions* failure mechanisms occur, as the professionals were unable to adopt the knowledge when it conflicts with their way of working and/or available resources. Knowledge transfer is a process of many knowledge interactions between sender and receiver, and these processes should be institutionally embedded, including incentives, otherwise these processes are not effective (or do not occur at all). To ensure that the uptake of the FODIKI methodology reaches at least the level of *effort*, additional incentives are required. Both within regional water authorities and at programme level, an institutional framework should be developed that shapes and requires permanent processes aimed at learning across projects and organisations.

7 Conclusions and reflection

Our general objective is to deepen the understanding of how (creation,) transfer and uptake of knowledge takes place in practice in the design processes of (multifunctional) flood defences, and ultimately how interventions can improve the knowledge transfer and uptake in these design processes. In this final chapter, we revisit our research questions, indicate where they are addressed, and summarise the insights obtained on the applicability of the FODIKI framework in the field of flood risk management. We then reflect on the limitations of the framework and of the research approach. Finally, we reflect on the practical value of our study, and on challenges for future research.

7.1 Summary of findings: answering the research questions

Flood Risk Management (FRM) problems are 'ill-structured', because flood risk issues are multidisciplinary and often linked to other local problems with a wide variety of stakeholders. This requires an integrated approach with an eye for dialogue with all stakeholders. As we indicated in chapters 1 and 2, the literature on participatory water management is rich, but relatively thin with respect to the way in which knowledge is transferred and adopted. In this study, we have investigated this aspect in detail, guided by five research questions.

RQ1: Which factors may explain knowledge transfer and uptake (or lack thereof) in the design process of the multifunctional flood defences?

To answer this question, we have extended the framework proposed by Vlachos (1978) that focuses on knowledge transfer between individuals in their role of sender (S) and receiver (R). In our conceptualization, we assume that when knowledge transfer succeeds, the knowledge transferred (K) is available to R, and R can choose to (start using) this knowledge. We have adapted the original model of Vlachos, as explained in section 2.3 to make it more in line with contemporary concepts.

We consider knowledge transfer to be *successful* when sensemaking occurs such that R has constructed personal knowledge that is in line with the knowledge that S intended to share. This corresponds to the second level of knowledge utilization (*cognition*, preceded by *reception)* defined by Knott & Wildavsky (1991). The five levels of utilization that Knott & Wildavsky identify beyond cognition provide a cumulative scale for what we mean by knowledge uptake. The scale is cumulative in the sense that each subsequent level builds on the previous levels: *reference, effort, adoption*, *implementation*, and *impact.*

In our framework, we distinguish four types of social mechanism that can explain the success of knowledge transfer and uptake: *preconditions, feedback, barriers,* and *failure mechanisms:*

(1) Preconditions for knowledge communication and reception include a need (N) for knowledge for which R may have different *grounds* (G), and *trust* (T), meaning that R must trust that S is competent and acting in R's interest, and that S must trust that R will make good use of K. Three particular knowledge interaction moments in our action research led us to add the precondition that S must have the *willingness to*

share, meaning that S and R wish to share and collaborate, and will not strategically withhold knowledge in pursuit of their own interest. We later also added the precondition *freedom to share,* as we saw that in some interaction moments third parties told the senders not to share the available knowledge, but only the 'less sensitive knowledge'. This aspect has not been addressed by other knowledge management (and policy process) researchers, while it affects knowledge transfer interactions in more politicized situations.

(2) Through *feedback* (fb), R communicates on a meta-level whether he understands the shared knowledge K, and points out barriers and failure mechanisms that (may) occur. This then enables S to adapt. In the knowledge interaction moments we observed, the feedback was mainly effective to overcome transmission barriers and cognitive barriers.

(3) We have identified three types of *barrier* that hinder knowledge transfer:
    1. Transmission barriers, where physical barriers hamper communication of K;
    2. Cognitive barriers, where R does not properly construct K;
    3. Psychological barriers, where K is conflicting with the identity of R.

(4) When barriers do not arise, or can be overcome, knowledge uptake can still fail due to seven types of failure mechanism:
    1. Incorrect use: K is used in different ways than intended by S;
    2. Institutional restrictions: R understands K, but is unable to adopt K as it conflicts with core values, and way of working ;
    3. Resources-restrictions: R understands K, but no sufficient resources are available;
    4. Dissipation: R forgot earlier transferred K;
    5. Lack of relay: R attempts to transfer K to new receivers but fails;
    6. Diffidence: a third party disqualifies K, and this dissuades R from uptake;
    7. Strategic power play: R understands K, but acts in his own interest.

The FODIKI framework integrates these elements in a coherent conceptual model that is more comprehensive than existing conduit models of knowledge sharing situations. During our action research, the framework evolved as the researcher gained more expertise (cf. section 7.2). In our original framework (Tromp & Bots, 2016), we identified some phenomena as barriers, but later realized that the observed behaviour actually reflected failure mechanisms. We also added failure mechanisms that could explain our observations in several threads, that were not covered by our initial framework.

RQ2: How can these potential determinants for knowledge transfer and uptake be observed in practice?

We have tested the internal validity of our framework by applying it to the case of the dike redesign process of Kinderdijk-Schoonhovenseveer (chapter 3). This historical case study demonstrated that our framework afforded categorisation and generalisation of salient observations on knowledge transfer interaction moments in a dike design process, and assessment of the actual transfer and uptake of knowledge (Tromp & Bots, 2016). To test the external validity of the framework, we have used an action research approach in a 'live' case, the dike redesign process between Gorinchem and Waardenburg (chapter 4 and 5).

For the researcher, having a background in civil engineering and public administration, and over ten years of FRM consulting experience, it was relatively easy to identify S and R, and to determine the knowledge needs and grounds, allowing to check whether the preconditions were met:

- Knowledge needs of the RWA and other governmental parties often result from policy choices and formal procedures for dike strengthening projects set by DFPP, as we saw in thread C2-TD in chapter 3. The knowledge need can also be inferred from the actor's interests, as we saw in, for example, chapter 3 thread C1-PC and chapter 4 thread XII.
- The precondition *freedom to share* was explicitly seen in chapter 4, thread XIII.
- Both in the KIS case and in the GoWa case, we saw that stakeholders are generally *willing to share* knowledge, and also transparent on their interests. If we assume that actors who hold their cards to their chest would not participate in the knowledge interaction moments, and that in large community meetings only stakeholders who are willing to share do speak up, then this explains why we (nearly) always observed that the willingness to share precondition was met.
- In the 'live' case, we could *in*directly observe the existence of *trust* between the participants by inferring it from paraverbal and non-verbal behaviour that indicated a sympathic ear or an open and active attitude. In chapter 5, in threads VII and VIII, the distinction between trust levels of the involved stakeholders became clear. In thread C1EC, we also observed that despite loss of trust, knowledge transfer and uptake continue when parties have strong incentives and forsee profit.

Experienced observers can assess the preconditions. For novices, these concepts can become meaningful and observable through training in a master-apprenticeship relation.

We observed feedback (fb), when receivers asked clarifying questions, or pointed out barriers and failure mechanisms that (may) occur. During the single interaction moments, we focussed on K that was shared, and on the reaction of the receiver in word, posture and behaviour. This allowed us to determine whether the transfer was successful. We could see the uptake up to the level of cognition or reference. The detection of higher utilization levels was only possible after several interaction moments, as we saw in chapter 5, threads VII and X.

We made no distinction between different types of knowledge. In the case study, we could trace the explicit knowledge through available documents. The direct involvement of the researcher, both in the KIS case, specifically around the innovations, and the GoWa case, allowed that some transfer of tacit knowledge could be also observed.

In sum, the needs, grounds, trust, and willingness and freedom to share knowledge as well as the identified social mechanisms can be observed, but this requires professional knowledge and skills.

RQ3: Does this observation allow diagnosis, i.e., plausible explanation of processes and outcomes?

The analysis of the KIS case in chapter 3 shows that the researcher was able to reconstruct a series of interaction moments, and could explain where knowledge transfer was hampered. The ex-post diagnosis of the researcher gave additional insights to the respondents on the changes made. Her reconstruction also showed that the stakeholders learned themselves throughout the project how to use the available knowledge. For instance, the DFPP-2 Programme board revised their procedures, which allowed the RWA to contact the external auditor directly to clarify any misunderstanding (see chapter 3, thread C2-TD). The project team of KIS also changed their community engagement approach while learning-on-the-job (see thread C1-PC). In the described threads of the KIS case, the knowledge uptake was illustrated on the utilization scale from *reference* to *implementation.* Four out of five utilization levels for uptake were found, and both levels for knowledge transfer (reception and cognition) were observed (with hindsight, KIS being a historical case study).

In the KIS and GoWa case, barriers and failure mechanisms could be identified and classified. We observed *transmission* barriers in several threads in the GoWa case, e.g., when a laptop having technical problems, interrupted the presentation, and the participants lost the message of the sender. We observed *cognitive* barriers when the sender used terms that did not fit with the frame of reference of the receiver. On one occasion, the misinterpretation of a single word (chapter 4, thread X) led to a defensive attitude of the AMG members as receivers. Also, the double meaning of certain words led to misunderstanding, as technical terms can have a completely different meaning to laypersons, (e.g., the concept 'artefact' in civil engineering differs from an 'artefact' as something made by a painter or sculptor). In some cases, the sender's response to the receiver's clarifying questions can mitigate cognitive barriers. *Psychological* barriers cannot be diagnosed so straightforwardly; these require more background information about the involved organisation or community, especially their core values and sense of identity. In the cases where this type of barrier occurred (e.g., chapter 4, thread IV, VI and VIII), the researcher observed that the receiver reacted defensively and somewhat offended. In our diagnosis, we framed this as incompatibility of the transferred knowledge with the practices of the receiver.

Barriers were predominantly diagnosed in the single interaction moments. Failure mechanisms can only be observed in a sequence of interaction moments. The tell-tale for a failure mechanism is that knowledge uptake does not proceed to the next utilization level. When the receivers refer to the previously shared knowledge (K) and indicate their concerns about why they believe that K is not valid, their reference to K indicates that the transfer has been successful, while their concerns indicate the presence of a failure mechanism. In chapter 3, thread C2TD, we clearly saw the *diffidence* failure mechanism. In the GoWa case, we likewise observed the diffidence failure mechanism, particularly in the cascading effects threads. This can be explained by the fact that throughout the community engagement approach, residents participated in some interactions, and in others they did not, resulting in an unequal knowledge base. On top of that, the involved residents had different opinions on the dike strengthening project, and were not always open to a particular message. In the GoWa case, all types of failure mechanisms were diagnosed, often multiple times.

The researcher validated her diagnoses with project team members from both dike reinforcement projects, and they generally confirmed the findings from the observations and the diagnoses made by the researcher. In the KIS case, the involved project team members stated that the diagnoses helped to gain more insight in the followed process, and that the lessons learned, and especially how the organisation learned, inspired fruitful discussions about current challenges. In the GoWa case, the reflection that is part of the action research spiral was also the starting point for those involved to learn about the way in which knowledge can be adopted. In our reflections, we found that the FODIKI framework can also be used to analyse the communication between the project staff and the researcher.

In sum, by analysing the available documents (KIS), and by focussing on paraverbal, non-verbal and verbal behaviour of the stakeholders (GoWa), we could diagnose the possible barriers and failure mechanisms in both studies, and these diagnoses could be validated with the involved project team members.

RQ4: Which interventions can improve knowledge transfer and uptake in design processes of multifunctional flood defences?

Throughout our action research, we observed and diagnosed over 130 knowledge interaction moments and performed approximately 100 interventions. Most of these interventions were knowledge management interventions, some were process management interventions.

Knowledge management interventions aim to remove barriers that occur during meetings to prevent misunderstanding. For *transmission* barriers, the intervention possibilities typically include anticipating on failing equipment, reducing exogeneous 'noise', and ensuring that someone having limited communication skills nevertheless presents or reports in a clear way. For *cognitive* barriers, the intervention possibilities typically include creating a common language, and properly tailoring the knowledge to the needs of the receiver. In the GoWa case, the researcher, depending on her role and freedom to act, intervened both directly and indirectly in meetings to remove these two types of barrier. In meetings such as those in threads I, II, IV and VII in chapter 5, the researcher performed a small action research cycle where she observed, diagnosed, and then intervened in real time in the meeting. For indirect interventions, e.g., as seen in chapter 5, thread III, she observed, diagnosed, and then suggested to another participant in the meeting to make one or more interventions. The *psychological* barrier requires more expertise to diagnose and intervene upon. The intervention possibilities typically include taking the receiver's need or perception as starting point, communicating clear and realistic expectations, and anticipating the impact of cultural differences. This type of intervention often takes place after a meeting, while preparing for the subsequent one.

Process management interventions focus on the process design of meetings. The sixteen design guidelines of De Bruijn *et al.* (2010), grouped around four main principles: openness, protection of core values, progress, and substance, imply possible interventions to strengthen trust and to mitigate failure mechanisms. The occurrence of failure mechanisms and/or lack of trust indicate necessary changes in the process design to sufficiently involve all relevant parties in the dike reinforcement project. As

failure mechanisms can be diagnosed only after a sequence of knowledge interaction moments, the intervention possibilities are considered after a meeting. The process designer should thoroughly design the chain of knowledge interaction moments, as we saw that at the process level power and uncertainty play a greater role. Substantive, strategic and institutional uncertainties can lead to the knowledge not reaching a higher utilization level. Both the *incorrect use* failure mechanism and the *diffidence* failure mechanism are linked to substantive uncertainty, the *institutional restrictions* failure mechanism links to institutional uncertainty, while the *strategic power play* failure mechanism links to strategic uncertainty. While planning for a subsequent meeting, the process design can be altered to mitigate a specific failure mechanism or to consolidate or strengthen trust. The process designer should be aware that, inherent to openness, the stakeholder configuration can change over time. This includes changes in the composition of the project team. Openness thus heightens the risk that knowledge may dissipate. Mentoring and storytelling can leverage the tacit knowledge of an organization or project to preserve core capabilities (Swap *et al.*, 2001). During our action research, the project officers learned to consolidate the chosen community engagement approach by (re)explaining it and summarizing the previous steps in each consultation meeting. This led to an equal knowledge base for all attendants, even when this group was a mix of 'newcomers' and 'old hands'.

Policy network interventions focus on the configuration of a network of actors and interactions, and includes the activation of actors, for example by safeguarding the preconditions. In the GoWa case, the researcher could not act on this, but she did emphasize the need to consider the stakeholder configuration at certain moments, when the project team was working towards the formal stage-gate moments.

The taken interventions effectively mitigated the diagnosed barriers and failure mechanisms. However, interventions are not always possible, as this depends on the role and freedom to act of the intervener.

Targeted interventions to improve knowledge transfer and uptake primarily require observation and analysis. Only then can interventions, based on the framework, be proposed that secure the preconditions, remove barriers and mitigate failure mechanisms. For interventions, there is no 'one size fits all'; each knowledge interaction moment must be observed and diagnosed to take the appropriate intervention. In chapter 5, thread VII, we saw that for the different ensembles different interventions were required, depending on the stakeholder configuration, the variety of needs of the participants, and so on. Moreover, needs are not static and change over time. Being context-dependent, every knowledge interaction moment requires diagnosis, even if particular interventions proved to be successful earlier.

In sum, the interventions we took during the GoWa case were predominantly knowledge management interventions. Each of the undertaken interventions appeared to be effective in removing barriers and preventing anticipated failure mechanisms, thereby enhancing the transfer and uptake of knowledge.

RQ5: Does the method work, and does the action-oriented approach contribute to the development of the professional field?

For the FODIKI methodology developed in this research, the dike re-design project Gorinchem – Waardenburg was 'the proof of the pudding'. We framed, observed and diagnosed numerous knowledge interaction moments, we intervened many times, and we found that our interventions effectively mitigated the diagnosed barriers and failure mechanisms. In this process, the researcher came to master the FODIKI methodology to the point that it became a discipline of thought. This raises the question whether the FODIKI methodology can be applied as successfully by others. We address this question by framing it as a knowledge transfer situation.

By carrying out action research, we aimed to give field practitioners tools to improve knowledge transfer and uptake in the redesign process of flood defences. Within different scopes, we tried to transfer the researcher's working method, including the associated language, to third parties. Here, the researcher acted as sender, and the parties involved as receiver. The FODIKI methodology facilitated participants, as they started to reason and act based on the framework. We successfully created awareness about the way in which knowledge is transferred and thus adopted, within three scopes:

(1) *Project scope:* Throughout the action research, the researcher frequently collaborated with several project officers in the period between December 2015 and December 2018. The first step was to raise awareness for knowledge sharing, and to think about the message the project team wished to communicate during meetings. Time was also needed for building mutual trust between the project officers and the researcher. In section 6.1 we saw that in less than one year, project officers had internalized the framework and applied it themselves. They also attempted to transfer their experiences and insights to their colleagues. Eventually, three project employees started to use the framework, which was shared via the context manager in the preparation and implementation of meetings. The uptake of the framework thus seems to have reached the level of *implementation.*

(2) *Scope of an organisation*: At the RWA Rivierenland, the researcher tested the transferability of the framework (1) with the Dike Strengthening Programme Team, responsible for the coordination of all dike-strengthening projects within this regional water authority, and (2) within a new domain: sustainability. The researcher collaborated with members of the Dike Strengthening Programme Team in the period between June 2017 and November 2018. At the organisational level, we consider uptake to be successful when the RWA employees say that they are aware that knowledge transfer and uptake require additional attention, and start considering one or more variables from the researcher's framework. Through the efforts of the researcher, the RWA employees now know that they need to carefully prepare knowledge transfer and uptake (*cognition*). Several RWA employees explicitly reflect on their actions, using elements of the framework (*effort*). These members of the Dike Strengthening Programme Team also fulfil a role as knowledge brokers in the organisation. Furthermore, the researcher conducted an intervision trajectory, in the period between September 2017 – January 2018, with a consultant in the field of sustainability. The researcher gave hands-on feedback to the consultant to help him prepare for several meetings. In section 6.2, we saw that

the consultant now tries to apply elements of the framework (*effort*).

(3) *Scope of a programme*: Being an intermediary between the RWAs and their projects, and also between policy and practice, the Dutch Flood Protection Programme (DFPP) acts as a boundary organisation (Van Meerkerk & Edelenbos, 2018), In order to carry out the DFPP task smarter, faster and cheaper, several RWAs carried out a number of innovation and technical research projects (TRPs). The knowledge gained in these projects should be transferred to the current and new DFPP projects. In the period between January 2016 and December 2018, the researcher collaborated with several representatives of these TRPs to raise awareness for knowledge sharing. The FODIKI framework helped to deepen the knowledge strategy of TRPs, and to mitigate transmission and cognitive barriers and failure mechanisms, in particular *no-relay, diffidence*, and *incorrect use*. However, this only works if the discussions on this subject take place at the project level. In section 6.3, we saw how the researcher, in her role as liaison officer, only partially succeeded in creating awareness of the importance of knowledge transfer and uptake, limiting the uptake to the level of *cognition.* To enhance the learning between DFPP projects, the application of the FODIKI methodology should be institutionally anchored on a programme level.

In sum, the uptake of the framework is different on the three scopes: within a project scope, the uptake of the framework has reached the level of *implementation*, within the scope of an organisation we see uptake to the level of *effort*, and within the scope of a programme the awareness of knowledge transfer and uptake reaches the utilization level of *cognition*. The differences are striking, considering that the sender, being the researcher, was always the same person.

These differences can possibly be explained in terms of preconditions, barriers and failure mechanisms. Within all three scopes, we noticed that some receivers did not have a knowledge need, and that when the receiver *did* have a need, the uptake was considerably higher. At the project level, the number of interaction moments was high, and coaching and transfer of the methodology occurred over a longer period of time. Within the scope of an organization, fewer interaction moments took place. A consultant on sustainability received specific support and training, which contributed to his internalizing of the FODIKI methodology. Within programme scope, the researcher was only able to transmit; establishing intervision was hardly possible. Knowledge had to be developed within the TRPs, but dissemination was limited. We saw earlier that knowledge is 'sticky'. To apply the FODIKI methodology, one has to be trained accordingly, via a master-apprentice relation, e.g., in an action research setting. Within the wider scopes, the conditions were simply less favourable. Creating awareness is relatively easy, and those involved often succeed in referring to elements of the framework, but this does not mean that they have worked the methodology into their working habits. Such adoption requires more guidance and training on the job.

In sum, we have seen the methodology work time and again as intended. However, adoption of the FODIKI requires coaching and training. Within the project, organisational and programme scope, we successfully created awareness about the way in which knowledge is shared and adopted. Those involved started to reason and act based on the framework, but the adoption takes place at the elementary level of interaction between sender and receiver.

7.2 Limitations of this research

Position of the researcher
In action research, it is important to safeguard the independence as a researcher. Action researchers perform research that not only answers a research question, but also helps practitioners in their work. There is a possibility that the action researcher is too much distracted by the needs of the professionals and loses sight of the question (Blichfeldt & Andersen, 2006; Rapoport, 1970). Throughout the study, the researcher should remain a neutral party. Nevertheless, as McKay & Marshall (2001), point out, referencing Hult & Lennung (1980), 'a mutual dependence exists in that both researcher and problem owner are reliant on the other's skill, experiences, and competencies in order for the research process to achieve its dual aim of practical problem solving and the generation of new knowledge and understanding'. The type of dependence changes over time. At the beginning of the action research, the researcher and the project team have different goals and information inequality, resulting in shallow dependence, but over time, both parties achieve information symmetry, creating interdependence (Shaub, 2004). At all times, the project team and other stakeholders should preserve trust in the researcher. In our action research, the neutrality and trust were put at risk in two moments.

The first moment occurred in the beginning of the action research, when during the kick-off meeting of the ensemble participation process (Spring 2016), the researcher made a beginner's mistake. In the plenary part of the meeting, the project manager explained on the basis of a map, for which dike failure mechanisms the dike should be strengthened, indicated by red and green lines. After splitting up in groups, the researcher was observing one specific ensemble. In this ensemble, the participants had many questions about the presented map, and the researcher spontaneously tried to help them with the interpretation of such maps. Having understood that the colouring on the maps could still change, the researcher explained the maps to the residents. Being drawn into the discussion, she appeared to take position. Later a project team member also explained the meaning of the colours on the map, but stressed that the entire dike needed to be reinforced and the colours on the map would *not* change. He pointed out that other explanations were invalid. In this way, he rejected the explanation of the researcher. Based on this experience, the researcher realised that she took on the role of expert but did not have the legitimacy to act as such. Therefore, she stressed in subsequent meetings that she was only an observer during the meetings. By taking on this role, she regained the legitimacy, in the eyes of the project team and participants, to perform action research.

After this 'wake-up call', the project team and the researcher made transparent agreements on how the researcher could intervene in the process in case of opportunities. They also agreed that only the aggregated findings of the questionnaires held by the researcher would be shared with the project team. This way, the researcher retained her independence and all participants continued to see her as a neutral party.

Trust, and thereby independence, can also be harmed by the way in which the researcher discusses the project with third parties. This occurred in Summer 2016, when the researcher wished to share the preliminary results with a scientific audience at a conference. To this end, the researcher designed a poster. As her regular contact person

was on holiday, she contacted another project team member and sent the poster to him to discuss the content. The poster stated, among other things, that the communication skills of one or more project team members was 'poor'. This gave the project team member the perception that the researcher critiqued the project. After consulting with a colleague, he interdicted presenting the poster in this way at the conference. After some discussion back and forth, the researcher and project team member jointly agreed to use another wording, and the researcher adjusted the poster accordingly. Immediately after the Summer break, the researcher apologized to the project team. She stressed that she had not sufficiently bridged the gap between the scientific world and the project team. In retrospect, the researcher realized that she had failed to foresee the barriers and ensuing failure mechanism in this interaction moment. Moreover, she realized that the FODIKI framework is also applicable to the interaction between herself and the project team. The trust was later regained, as the researcher made valuable contributions to the community engagement approach. In the years that followed the researcher kept her neutrality and developed what Shaub (2004) calls a mature researcher-client relationship.

The fact that the researcher can overtly report these two episodes in this chapter illustrates the openness of the GoWa project team. That has been invaluable throughout this study, which became indeed 'action research as a social process of collaborative learning realized by groups of people who join together in changing the practices through which they interact in a shared social world in which, for better or worse, we live with the consequences of one another's actions' (Kemmis & McTaggert, 1988). Due to the presence of the researcher in the meetings the 'observer effect', also known as the 'Hawthorne effect', occurred. Monahan & Fisher (2010) stress that to 'put [it] simply, critics assert that the presence of a researcher will influence the behaviour of those being studied, making it impossible for action researcher to ever really document social phenomena in any accurate, let alone objective, way (Wilson, 1977) [...], but that with sufficient time, informants will become inured to the presence of the researcher, let down their guard, and behave 'normally' (Geertz, 1973; Stoddart, 1986)'. Its effect on the knowledge transfer and uptake was limited as the researcher was present over a longer period of time.

Validity of the methodology

The FODIKI framework expands the widely accepted conduit model by integrating other elements from scientific literature in a semantically sound manner. The concepts are sufficiently operational to be observed, so that the condition of construct validity (Yin, 2011) has been met. This enabled the researcher to give consistent meaning to her observations. She has always verified her diagnosis with stakeholders, actively seeking feedback and criticism, and acting upon it. The people involved had strong stimuli to react, because they wanted to acquire knowledge, because they had strong interest in this project, and also because the researcher gave insight into their own functioning, which could be confronting. Throughout our action research, we encouraged the project team and other participants to give pushback. In most cases, they gave reactions on the diagnosis, like 'I think you are right'. The participants made compliments on her work in the questionnaires, or they gave feedback in person on the role and advice of the researcher. At several occasions during the research, ensemble leaders expressed their appreciation for the value added by the researcher.

In the GoWa case, the framework described in Tromp & Bots (2016) was used at the beginning of 2016. In the early stages, the framework was only used for ex-post diagnosis. After the start of the intensive participation process, the researcher also began to intervene directly or indirectly in real-time. In Q1 2018 the researcher made observations that she could not link directly to her barriers and failure mechanisms. This led to modifications: the original cognitive barrier was split into the transmission barrier, the cognitive barrier and the psychological barrier; the resources-related barrier and the institutional barrier were recognized to be failure mechanisms. At the beginning of Q2 2018, the researcher found that the freedom to share was an important precondition. After this, she further refined her social mechanisms by detailing their explanation and how they can be observed in real-time circumstances, but the types of mechanism have remained the same, preserving semantic coherence. The framework appears robust, and affords observati°n and diagnosis of the observed interaction moments. This means that the condition of internal validity is met.

External validity entails that findings are generalisable across a range of situations. The unit of analysis of the FODIKI framework is a single knowledge interaction moment, and although we investigated only one live case, we analysed more than 130 knowledge interaction moments. However, these interaction moments all took place within the same context. Twaalfhoven (1999) shows that the unique characteristics of the context in which a study is conducted can influence how actors define and describe the successes and failures. Even so, we consider the dike redesign process between Gorinchem and Waardenburg to be representative for projects within the Dutch Flood protection domain. The GoWa project follows the MIRT approach, and is in terms of complexity a mainstream project within the DFPP programme. Although GoWa is the first project with an early intensive community engagement process and an alliance contract, it is seen as an example of how the community can be involved in the project (DFPP, 2018). It can hence be expected that follow-up projects will resemble GoWa to a great extent.

The original ambition of the FODIKI methodology was to improve the effectiveness of knowledge transfer and uptake in knowledge interactions. The methodology promotes diagnosis and reflection on possible interventions, based on the diagnosis. At a more political level, it transcends the original ambition: the framework still helps to identify possibilities for improving knowledge transfer and uptake, but political interventions are more in the field of the process management interventions of De Bruijn & Ten Heuvelhof (2003). The FODIKI methodology can help to design a process intervention (additional interaction moments), but there will always be the risk of an incorrect diagnosis. To our knowledge this happened only once. In chapter 4, thread XIV, when sharing knowledge, an ensemble member set conditions for its use, in what appeared to be as a claim of emotional ownership of the knowledge. Our diagnosis was that the ensemble member was less willing to share the knowledge, and lost trust in the receiver. This diagnosis would have called for significant process management interventions to, among other things, restore trust, but these were not taken. When the context manager reviewed chapter 4 of this thesis, he told the researcher that the strongly emotional reaction of the ensemble member was actually due to work-related developments that required a great deal of time and energy of this ensemble member, and not because of the perceived fear for resources-related barrier for uptake of their knowledge, and that he therefore did not make any process management interventions. This ‘false positive’ affirms the limited observability of trust.

Using the FODIKI methodology at the level of stakeholder configuration is even more difficult. In chapter 2 we already showed that in the Netherlands the MIRT approach encourages stakeholders' involvement but leaves t's design to the initiator of the project. A process manager aiming for democratic and institutional anchoring of shared knowledge could use the FODIKI methodology. However, in this study we have demonstrated that many stakeholders are insufficiently aware of the necessity of knowledge transfer and uptake. As a result, sharing knowledge across projects is inadequately supported by the parties involved, with the result that the knowledge is not adopted. The uptake of the FODIKI methodology requires 'further embedding and coordination between the often informal governance processes and the formal political and democratic decision-making processes' (Van Buuren *et al.*, 2007).

External validity also entails that other individuals should be able to apply the FODIKI methodology. As reported in chapter 6, we have tried to transfer the conceptual elements of the framework within three different scopes. Within the project scope, we guided a selected group of people in a master-apprentice formation, and indeed these people learned to apply the framework successfully. It appears that the framework can be applied successfully to any action research context, as long as the researcher has access to meetings and relevant documents and the possibility of sparring with the process manager in an action research cycle. The parties involved then embark on a bilateral learning process. Both within the organisation RWA scope and programme scope, the researcher conducted intervision trajectories. Within both scopes, we found that interaction at the elementary level, i.e., in interactions similar to the project level, should take place to have an impact. This is in line with Cohen & Levinthal (1990), who found that it depends on the absorptive capacities of its individual members. Volberda *et al.* (2010) showed that 'Minbaeva *et al.* (2003) emphasize the importance of individuals' ability (education, skills and competences) as well their motivation to absorb external knowledge'. Knowledge absorption is easier when it fits the frames of references of the individuals and is linked to their own identity. Otherwise, in FODIKI terms, a psychological barrier occurs. With the Rivierenland cases, the involved individuals were intrinsically motivated to learn individually and as organisation. The absorptive capacity of an organization consists of the routines and processes of an organization to translate and gain new knowledge and to assimilate the knowledge (Zahra & George, 2002). For other organisations and programmes, such as other RWAs, the degree in which organisational learning takes place, will vary depending on its absorptive capacity.

Even if FODIKI expertise is transferable to others, the question remains whether these professionals have the same position as the researcher had. Within all three scopes, the researcher has played a linking role. Due to her secondment at the Programme Board of DFPP, she knew of all developments around knowledge sharing from other DFPP projects and TRPs, and conducted a study on the awareness of the TRP project team members of the importance of knowledge dissemination. She also shared relevant insights with the Programme team members of RWA Rivierenland and the project team members. In this way, she acted as 'boundary spanner' (Williams, 2002), fulfilling three roles: a *broker* who reformulates the information disseminated in arenas, a *translator* who translates (problem) perceptions of actors so that actors understand each other better, and a *synthesizer* who sees which information can be combined to arrive at new insights (Feldman & Khademian, 2007; Rath 2015). Through her experiences at the project level,

she was able to combine knowledge at the RWA and programme level, in such a way that new insights were gained by all participants. This opportunity to bridge all three scopes to share knowledge in different arenas to enhance the knowledge uptake may well be unique.

7.3 Opportunities for future research

In our research, we applied the FODIKI methodology to one historical case and one 'live' case, and in both cases it showed its potential. We also found that the framework can be used to reflect on action research cycles. Although its basic design and elements are not innovative *per se*, the framework is original in the way it combines and operationalises its elements. Nevertheless, there is still room for improvement and sharpening of the activities of observation, diagnosis and intervention, while the external validity of FODIKI should be tested by applying it in more – and more diverse – cases.

Improving observation
In the cases considered in this research, trust (T) proved to be an important factor. In our research, we observed trust through participants' attitude and behaviour. Where possible, we correlated this with the existing typologies of trust. Nevertheless, the differences in trust levels between the different communities have not been explored in full depth. Our questionnaires and observations leave room for further refinement. We believe that a more fine-grained analysis will result in an enrichment of the empirical data and potential interventions.

Compared to trust, the concepts of needs (N), grounds (G) and drivers (D) are less elaborated. Although the researcher, thanks to her experience within the FRM domain, was able to observe them, a more systematic approach for observation and analysis of these three elements is needed. In chapter 2, we have distinguished four types of grounds: formal grounds, substantive grounds, processual grounds, and strategic grounds. In this study, we have mainly explained the formal grounds. We often linked the other types of grounds to the different types of drivers (economical, personal, strategic, process scale). As far as we know, no overview is available that clarifies for the flood protection domain which grounds and drivers are typical for the various stakeholders involved. We believe that further research in this area will afford more precise diagnosis and determination of the necessary interventions.

Improving diagnosis and intervention
In this study, we identified various types of barrier and failure mechanism through a literature review, and refined and adapted these based on the KIS case and GoWa case. These types could be elaborated further by investigating which barriers and failure mechanisms usually occur for a particular type of knowledge (K). In this study, we made no distinction between the different types of knowledge (institutional, procedural, and substantive knowledge.

As it requires competencies to make well-considered interventions in real time, further development of a knowledge transfer and uptake toolbox can provide added value. Throughout the action research cycles during the redesign process of the Gorinchem - Waardenburg dike, the interventions were developed and grouped in three intervention

categories. We expect that further elaboration of these categories will provide an even clearer picture of which intervention should be linked to which observation. In addition, we did not investigate whether the type of knowledge (explicit, tacit) affects what interventions are possible. Further research may also improve our understanding of what works when. The scientific literature on possible interventions is rich (Holsapple, 2004), but we expect that few field practitioners read this. The field practitioners need practical guidelines similar to the technical guidelines (Dutch: *technische richtlijnen*) that are used within the Dutch FRM domain. The 'FODIKI language' could provide a sound basis for these guidelines. We recommend a systematic review and analysis to further categorise the interventions that includes both scientific literature and practitioner or craft literature. This overview should then help field practitioners and process analysts both in the preparation of a participatory design and during the meetings.

Testing the general applicability of the FODIKI methodology

The starting point of the FODIKI methodology was to observe, diagnose and, if needed and possible, intervene to enhance knowledge transfer and uptake. All our conversations with professionals and other stakeholders have shown that everyone finds it important to properly communicate, and to share available knowledge. At the same time, we have seen that knowledge transfer and uptake often fail. It appears that the involved stakeholders are currently insufficiently trained, and that field practitioners in the flood risk management domain lack practical tools that enable them to use knowledge more effectively in their regular processes. The FODIKI methodology is such a tool. In this study, we have applied the FODIKI methodology to the RWA Rivierenland. At that time, this RWA was implementing several organisational changes based on their experiences. A question still unanswered is to which extent the organizational change management (cf. section 6.2) influences the knowledge uptake across projects. Our first recommendation is to apply the framework in action research to other dike reinforcement projects at different RWAs, so that we can further examine whether the ideology entailed by the framework is acceptable for other RWAs. Our second recommendation is to also apply the FODIKI framework to a broad range of knowledge interaction moments in various domains, as the elements on which the framework is based stem from other domains than flood risk management.

The DFPP Programme board, as coordinator of the dike reinforcement programme, aims that all necessary dike strengthening projects are realized within time and available budget. To achieve this, the projects should be carried out faster, cheaper and smarter. The programme board considers, applying innovative techniques to be a success factor. Therefore, knowledge dissemination between projects and involved organizations is of utmost importance. In chapter 6, we concluded that stakeholders often maintain reciprocal relations, whereby cooperation continues in successive projects over a longer period of time. In the current-day playing field, the lack of resources (time, money and other resources) is often mentioned as a reason not to share knowledge, even though the total spending on knowledge dissemination is only a fraction of the investment costs. The programme board could set conditions for this dissemination, such as 'comply or explain', as incentive to use available knowledge in projects. However, the situated nature of knowledge means that the 'project know-how' (institutional and procedural knowledge) obtained in a project cannot simply be transferred to another context. The 'technical know-how' (substantive and procedural knowledge) obtained by private

parties during the development of product innovations is likewise situated. In addition, a tension arises between the autonomy of the RWA and local stakeholders and DFPP's desire to use specific knowledge and techniques. We recommend the DFPP programme board to apply the FODIKI methodology in an action research setting to design the knowledge transfer of DFPP innovations. This study may reveal new barriers and failure mechanisms related to, e.g., intellectual property (Choo & Bontis, 2002; Granstrand, 1999) and competitive advantage (Argote & Ingram, 2000; Namada, 2018). A systematic approach and analysis will lead to a better understanding of types of barrier and failure mechanism, and ultimately to more effective interventions.

Appendix A: Data sources for the KIS case study

1. Researcher involvement in case study KIS

We could directly observe stakeholder interactions in this case study because we were personally involved in multiple roles:

1. As *liaison officer* between technical manager of DFPP-2 and the external auditor. We organized the audits and made sure that auditors with sufficient knowledge were available for each project phase. We had several regular meetings with the TM to discuss the role of the XA. We also advised on how the audits could be better fitted in the whole review process. We also helped develop the auditing procedures for the geotechnical and hydraulic audit. [Relevant for thread C2-TD]
2. As *innovation officer* and *consultant* for the pilot testing. We were responsible that the gained insights during the pilot testing would be generically applicable. We supported the RWA and the PT with crafting the innovation management process to start the pilot testing. When necessary, we would suggest measures for improving the overall knowledge management process. We also had partial access to the substantive progress reports on the pilot testing of both techniques. [Relevant for threads C1-EC, C1-MIP and C1-DR]
3. As *client* for (1) the process evaluation after the pilot testing, and (2) evaluation of the procurement of KIS to assess whether this procurement stimulated contractors to innovate.

Because of our direct involvement, we could also consult our personal archive of email conversations (period 2008-2014), comprising over 300 pertinent messages.

In our case study, we also consulted policy documents, evaluation reports, and other sources.

2. Relevant policy documents

- Bureau Helsdingen, (2011), CULTUURHISTORISCHE INVENTARISATIE DIJKVAK KINDERDIJK - SCHOONHOVENSEVEER, definitief, juli 2011.
- Deltares, (2012), Dijkversterking KIS C2 audit, 3e ronde februari 2012, 1203849-017-GEO-0002, Versie 01, 4 maart 2012, concept.
- Deltares, (2011), Dijkversterking KIS C2 audit, 1203849-009-GEO-0002, Versie 01, 25 augustus 2011, definitief.
- Deltares, (2011) Dijkversterking KIS C2 audit, ronde 2, 1203849-017-GEO-0002, Versie 01, 25 augustus 2011, definitief.
- Deltares, (2010), Audit Lekdijk Kinderdijk-Schoonhovenseveer, Startnotitie Hoogwaterbeschermingsprogramma, reference 1201519-025-GEO-0002, Versie 4, 3 november 2010, definitief, Delft.
- Deltares, (2010), Audit Lekdijk Kinderdijk-Schoonhovenseveer, Startnotitie, reference 1201519-007-GEO-0002, Versie v2, 16 juni 2010, definitief.
- DHV, (2010), Startnotitie voor de m.e.r. Dijkverbetering Kinderdijk-Schoonhovenseveer, eindversie, Tiel, 26 februari 2010, reference WSRL : 201000418.

- H+N+S, (2010) Dijkversterking Lekdijk Kinderdijk – Schoonhovenseveer, Handreiking Ruimtelijke Kwaliteit, Amersfoort, januari 2010.
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- Terra Incognita, (2013), Klimaatdijk en Jachthaven Liesveld, beeldkwaliteitsplan en inrichtingsplan, in opdracht van WSRL, definitief, 28 november 2013.
- Waterschap Rivierenland, (2013), 1e uitwerking beleid dijkversterking Kinderdijk-Schoonhovenseveer, concept 1.
- Waterschap Rivierenland, (2011), Dijkversterking Kinderdijk-Schoonhovenseveer C2-moment, motivering oplossingen met sloop en herbouw panden, memo, d.d. 25 september 2011.
- Waterschap Rivierenland, (2009), PLAN VAN AANPAK (incl. beheersplan) Planstudie Dijkverbetering Lekdijk Nieuw-Lekkerland – Groot Ammers dijkring 16, Tiel, 27 januari 2009.
- Witteveen+Bos (2013), Geotechnische rapportage dijkversterking Kinderdijk-Schoonhovenseveer, in opdracht van WSRL, reference TL200-7/zutd/210, definitief 02, 29 maart 2013.

3. Evaluation reports

- Deltares, (2014), De waterkering: flexibel gebruik in de ruimte, Handvatten voor toepassing in de praktijk, 1207938-008-VEB-0006, Versie 1, 13 februari 2014, definitief.
- Deltares, (2013), Evaluatie aanbestedingstraject KIS, In hoeverre heeft de gekozen wijze van aanbesteding het innovatie vermogen van de markt aangesproken?.
- Netwerk Deltatechnologie, (2009), Leren van innoveren in de delta, pagina 35-41.
- Tornak, (2010), Procesevaluatie Praktijkproeven INSIDE, dijkversterking Mixed-in-Place en Dijkdeuvels.

4. Other media, such as newsletters, brochures, et cetera.

- Rijkswaterstaat (2011), Bestuurdersbijeenkomst 'vervroegde marktbenadering' bij Waterschap Rivierenland, dd. 10 februari 2011, verslag bijeenkomst, Tiel.
- Rijkswaterstaat (2009) INSIDE-technieken, Mooi van buiten, sterk van binnen, brochure, oktober 2009, wd1009cp001
- Waterschap Rivierenland, (2012), Nieuwsbrief, Dijkverbetering Kinderdijk – Schoonhovenseveer, nr.3., oktober 2012.
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- Waterschap Rivierenland, (2009), Nieuwsbrief, Dijkverbetering Kinderdijk – Schoonhovenseveer, nr.1., juli 2009.
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Appendix B: List of knowledge interaction moments GoWa case

	Knowledge interaction moment	Date
1	AMG	7-12-2015
2	SBG	17-2-2016
3	Project team meeting	23-2-2016
4	Bilateral consultation CM - Researcher	10-3-2016
5	SBG	23-3-2016
6	Written feedback to CM	24-3-2016
7	AMG	31-3-2016
8	EMG	4-4-2016
9	Project team meeting	13-4-2016
10	Project team meeting special	20-4-2016
11	Walk in meeting	12-5-2016
12	Walk in meeting	19-5-2016
13	Kick off meeting Ensembles	24-5-2016
14	Evaluation of Kick -off meeting	6-6-2016
15	Bilateral consultation CM - Researcher	6-6-2016
16	Project team meeting	21-6-2016
17	AMG	21-6-2016
18	Reflection on AMG	21-6-2016
19	Reflection on project team meeting	21-6-2016
20	Ensemble Haaften	21-6-2016
21	EMG	6-7-2016
22	Bilateral consultation CM - Researcher	14-7-2016
23	Ensemble Haaften	20-9-2016
24	Trilateral consultation CMs -Researcher	2-11-2016
25	Internal meeting RWA	7-11-2016
26	Trilateral consultation presenters Crash course- Researcher	7-11-2016
27	Crash course ‘designing dikes’	7-11-2016
28	ELs meeting	15-11-2016
29	Internal meeting Ensembles	22-11-2016
30	SBG	29-11-2016
31	AMG	1-12-2016
32	Ensemble Haaften	7-12-2016
33	ELs meeting	14-12-2016

	Knowledge interaction moment	*Date*
34	Bilateral consultation CM - Researcher	5-1-2017
35	Project team meeting	17-1-2017
36	Evaluation meeting tender	17-1-2017
37	ELs meeting	17-1-2017
38	EMG	23-1-2017
39	Community meeting Vuren	24-1-2017
40	Community meeting Linielandschap	26-1-2017
41	Community meeting Haaften	2-2-2017
42	Community meeting Tuil-Waardenburg	7-2-2017
43	Reflection trilateral meeting CMs - Researcher	8-2-2017
44	Meeting representative Rivierenland evaluation tender	8-2-2017
45	Community meeting Herwijnen	8-2-2017
46	Trial presentation ensembles	16-2-2017
47	Trilateral meeting CMs - Researcher	16-2-2017
48	Reflection PM	17-2-2017
49	External meeting	22-2-2017
50	SBG	23-2-2017
51	Reflection CM and PM	6-3-2017
52	ELs meeting	7-3-2017
53	ELs meeting	20-3-2017
54	AMG: special session	21-3-2017
55	Image-forming council meeting for municipality	11-4-2017
56	Bilateral consultation CM - Researcher	12-4-2017
57	Trilateral CMs - researcher	19-4-2017
58	Combined SBG/ELs meeting KBG/trekkersoverleg	19-4-2017
59	Board conference	21-4-2017
60	Project team meeting	9-5-2017
61	Bilateral consultation PM - Researcher	9-5-2017
62	Bilateral consultation CM - Researcher	20-6-2017
63	Project team meeting	20-6-2017
64	ELs meeting	26-6-2017
65	Trilateral meeting CMs - Researcher	27-6-2017
66	Ensemble drinks	29-6-2017
67	SBG	29-8-2017

	Knowledge interaction moment	*Date*
68	ELs meeting	31-8-2017
69	Bilateral meeting CM- Researcher	4-9-2017
70	Bilateral meeting CM- Researcher	12-9-2017
71	Residents' meeting Herwijnen 3	19-9-2017
72	Residents' meeting Haaften	20-9-2017
73	Presentation for the Graaf Reinald Alliance	21-9-2017
74	EMG	25-9-2017
75	Bilateral consultation CM - Researcher	24-9-2017
76	ELs meeting	3-10-2017
77	Special session AMG	11-10-2017
78	Bilateral consultation CM - Researcher	23-10-2017
79	SBG	25-10-2017
80	Bilateral consultation CM - Researcher	26-10-2017
81	ELs meeting	2-11-2017
82	Triilateral consultation CMs - Researcher	15-11-2017
83	Walk in meeting GoWa	21-11-2017
84	Walk in meeting GoWa	30-11-2017
85	ELs meeting	18-12-2017
86	SBG	19-12-2017
87	AMG	20-12-2017
88	Bilateral consultation resident - Researcher	18-12-2017
89	Reflection with COMs - Researcher	19-12-2017
90	Ensemble meeting	24-1-2018
91	AMG	29-1-2018
92	ELs meeting	29-1-2018
93	SBG	30-1-2018
94	Bilateral consultation CM - Researcher	7-2-2018
95	EMG	8-2-2018
96	Bilateral consultation CM - Researcher	19-2-2018
97	ELs meeting	8-3-2018
98	Walk in meeting NRD	5-4-2018
99	ELs meeting	17-4-2018
100	AMG	18-4-2018
101	SBG	18-4-2018

	Knowledge interaction moment	*Date*
102	EMG	26-4-2018
103	Reflection on Ensemble Haaften	18-4-2018
104	Trilateral consultation alliance manager – CM- researcher	9-5-2018
105	Bilateral consultation CM - Researcher	6-6-2018
106	Bilateral consultation consultant - Researcher	18-6-2018
107	Reflection with CMs - Researcher	18-6-2018
108	ELs meeting	18-6-2018
109	AMG	26-6-2018
110	Reflection with CMs - Researcher	26-6-2018
111	Bilateral consultation CM - Researcher	26-6-2018
112	Trilateral consultation Alliance manager – CM - Researcher	27-6-2018
113	SBG	27-6-2018
114	EMG	6-7-2018
115	Bilateral consultation CM - Researcher	22-8-2018
116	Bilateral consultation CM - Researcher	22-8-2018
117	Bilateral consultation CM - Researcher	22-8-2018
118	Preparatory meeting ‘walk-in’ meetings with ELs / SBG	22-8-2018
119	Bilateral consultation CM - Researcher	30-8-2018
120	ELs meeting	3-9-2018
121	Walk in meeting preferred alternative	6 & 8 -9-2018
122	AMG	11-9-2018
123	Bilateral consultation CM - Researcher	11-9-2018
124	Reflection with CMs - Researcher	12-9-2018
125	SBG	12-9-2018
126	EMG	27-9-2018
127	Bilateral consultation CM - Researcher	10-10-2018
128	Bilateral consultation CM - Researcher	5-11-2018
129	Bilateral consultation CM - Researcher	7-1-2019
130	Bilateral consultation CM - Researcher	25-1-2019

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Curriculum Vitae

Ellen Tromp was born on 11 December 1981 in Alkmaar, the Netherlands. She finished her secondary education at the Markland College in Oudenbosch in 2000 and went to Delft University of Technology in the same year to study Civil Engineering. She obtained her Master of Science in Water Management in 2005 with the thesis: 'Application of a semi-distributed hydrological model based on the REW approach to the Collie River Basin, Western Australia'. After graduating, she started her career at GeoDelft, which later became part of Deltares. In 2011, while still working at Deltares, she obtained her second Master of Science degree in Public Administration from Erasmus University Rotterdam (The Netherlands), with the thesis: 'Knowledge? Decided! A model of the roles, commitment and the uptake of knowledge on decision-making applied to water interests in spatial planning' (in Dutch only).

Initially, she was involved in projects on water robustness and settlement-free development of locations with soft soils. Tight coupling of spatial planning and flood risk management (FRM) has created opportunities to incorporate water management measures in urban (re) construction and landscaping that call for more integrated design processes, and for strategies that also address governance and funding. Presently, Ellen is mainly active in interdisciplinary projects in the field of water, subsoil and spatial planning, with a focus on dike redesign in its surroundings, involving technical and process innovations and stakeholder engagement. Since 2012, she has been part-time working for the Dutch Flood Protection Programme (DFPP) to stimulate the use of state-of-the-art knowledge and innovations.

Ellen started her part-time (0.7 fte) PhD trajectory in October 2014, and completed her doctorate with Deltares and Delft University of Technology, financed by NWO-TTW as project 12182 within the NWO-TTW programme 'Integral and sustainable design of multifunctional flood defences'.

Overview of dissemination

Here, we follow the NWO-TTW classification for the overview of dissemination, distinguishing between scientific articles, book contributions, professional publications, reports, tools, and media attention.

Publications

Scientific articles

Tromp, E. & Bots, P.W.G. (2016). *Knowledge Transfer and Uptake in Design Process of Flood Defences: Case of Kinderdijk – Schoonhovenseveer*, European Conference on Knowledge Management (ECKM2016), 31 August – 2 September, Belfast, UK.

Jorissen, R., Kraaij, E. & **Tromp, E.** (2016), Dutch flood protection policy and measures based on risk assessment. In *E3S Web of Conferences* (Vol. 7, p. 2016). EDP Sciences.

Tromp, E. & Bots, P.W.G. (2018), *Enhancing Local Knowledge Uptake through Stakeholder Engagement in Dutch Dike Redesign,* European Conference on Knowledge Management (ECKM2018), 5 – 7 September 2018, Padua, Italy.

Book contributions

Buuren, M.W. van, Duijn, M., **Tromp, E.** & van Veelen, P. C. (2015). Adaptive flood risk management for unembanked areas in Rotterdam: cocreating governance arrangements for local adaptation strategies. In M.W. van Buuren, J. Eshuis & M. van Vliet (Eds.), A*ction Research for Climate Change Adaptation: Developing and Applying Knowledge for Governance* (164-181). London: Routledge.

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Professional publications

Schelfhout H., **Tromp E.**, van Meurs G., & Pereboom, D. (2014). Multifunctionele waterkeringen in de stad, *Stadswerk magazine*, 7, 50 – 53.

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Reports

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Tromp, E., Knoeff, H. Tanis, H., Heijn, K., & Leung, N. (2016). *Handreiking Innovaties Waterkeringen*, Definitief- Versie 1 november 2016.

DFPP (2017). *Innovatie Next Level*, report, summer 2017.

Presentations at (inter)national conferences

Tromp, E. (2016). Successful Knowledge Transfer Interventions in a Flood Defence Redesign Process in the Netherlands, *Poster*, European Conference on Knowledge Management (ECKM2016), 31 August – 2 September, Belfast, UK.

Tromp, E. & Keuzenkamp, A. (2016). *Innovatie, wie durft?*, POVdag, 13 oktober 2016.

Kraaij, E., **Tromp, E.,** & van den Top, G. (2016). De *kracht* van s*amenwerking benut?, kennisdoorwerking*, POVdag, 13 oktober 2016.

Kraaij, E., Luiten, J., **Tromp, E**., Allin, R. & Wittwer, C. (2016). *Enhanced implementation of EU-Flood Risk Management projects*, special session at FloodRisk 2016, 19 October, Lyon, France.

Tromp, E., Allin, R., & Luiten, J. (2017). *Identification of Interchangeable elements to Enhance the Implementation of EU-FRM programs: lessons learned from UK and NL* (extended abstract), International Conference on Flood Risk Management, September 2017, Leeds UK.

Tromp, E. & Bots, P.W.G. (2017). *Organizational Learning to Unleash Creative Capacity of Contractors*, (extended abstract), International Conference on Flood Risk Management, September 2017, Leeds UK.

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Tromp, E., Kraaij, E., Nonnekens, H.N., Schepers, M., & de Jong, L. (2018). *How to get a far-reaching flood defence socially accepted*, poster for the Excellence Awards EA Category International Excellence, Telford, UK, https://www.floodandcoast.com/project-excellence/2018-shortlisted-entries/.

Tromp, E. (2018). *Samenwerken aan dijkprojecten: succes- en faalfactoren*, KNW symposium Ruimtelijke inpassing van Dijken, 5 juni 2018, Slot Loevestein, The Netherlands.

Tromp, E. & Nonnekens, H.N. (2018). *Integrated working, experiences from GraafReinaldAlliance and TEAM2100*, presented at Dijkwerkersdag 2018, 7 June 2018, Congrescentrum 1931 in Den Bosch, The Netherlands.

Other deliverables

IGO tool (Interactieve Gebiedsontwikkelings tool) – mock up, Deltares (2016), *Interactieve gebiedsontwikkelingstool*, report reference, 1230048-007-GEO-0001, 20 pages.

Awareness game 'From experience to uptake', documented in section 6.2 of this thesis.

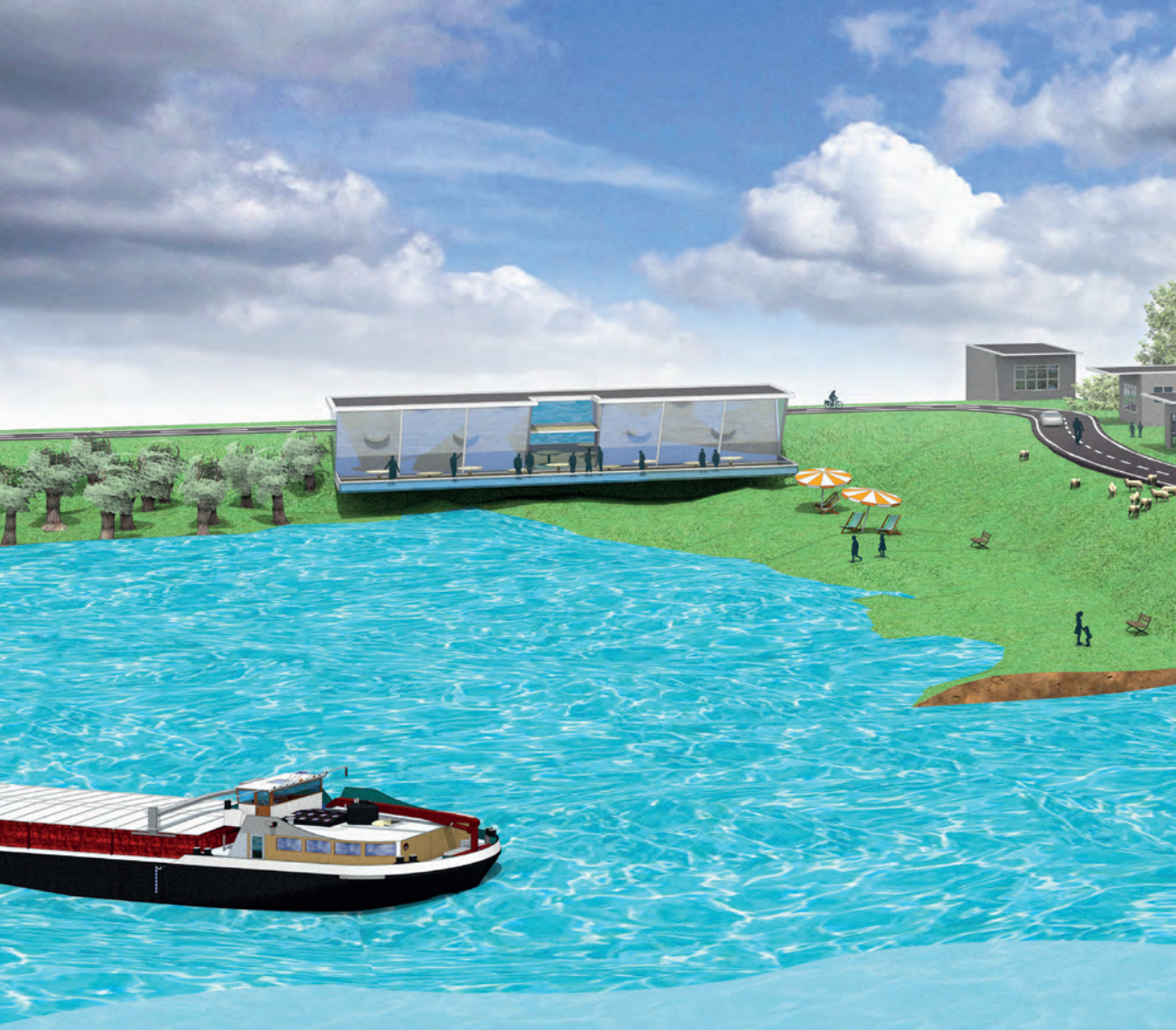
Media

Handing over the report on "Kennisdoorwerking POVs – Projecten, Hoe de ontwikkelde kennis landt binnen de HWBP projecten/ programma" to dike reeves of the regional water authorities and the director of DFPP, via link: https://www.deltares.nl/nl/nieuws/nieuwe-kennis-uit-de-projectoverstijgende-verkenningen-optimaal-benutten/

Interview on the Dutch Radio on Dikes and innovations, BNR Bouwmeesters, dd. 1 februari 2017, Thema: dijken en innovaties: links:

1. https://www.bnr.nl/player/archief/201702011533001680
2. http://www.bouwendnederland.nl/nieuws/3749941/bnr-bouwmeesters-over- dijken
3. https://www.bnr.nl/…/bnr-bouwmee…/10317411/1-februari-dijken

Interview for Green Planet Monitor on Multifunctional Flood Defences, case Boulevard Scheveningen: https://www.greenplanetmonitor.net/earth-biosphere-atmosphere/climate-change/water/dutch-dikes/



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