# Organisational learning through reflection: the case of gate reviews

Master thesis


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## PREFACE

This report is the final result of the master thesis ‘’Organisational learning through reflection: the case of the gate reviews’’. The research for this thesis is conducted at Van Hattum en Blankevoort to finish the final part of my master’s in construction management and Engineering at the University of Twente.

The research was performed due to my interest in learning within the construction industry. From personal experiences I have noticed that learning across projects is rather difficult. Hence, my ambition was to bring learning in project-based organisations one step closer. My thesis presents a new perspective on learning within the construction industry, by utilizing reflection to stimulate the complex process of organisational learning. The research raised numerous challenges which my supervisors have greatly helped me to overcome.

Firstly, I would like to thank the colleagues at Van Hattum en Blankevoort involved in my research project for their contribution and opportunity for conducting the research. Especially, I would like to thank David de Rooij for his feedback and helping me to stay on course. Secondly, I would like to thank Andreas Hartmann and Joanne Vinke-de Kruijf from the University of Twente for their guidance and feedback they have been providing throughout the process. I have enjoyed the reflective meetings on my work and greatly appreciate your knowledge input. Finally, I would like to thank my girlfriend Roanne Bosman, my family and friends for their continuous support throughout the journey.

I hope you will enjoy reading my master’s thesis and hope you will remember what John Dewey, an American philosopher, once said:

*‘’We do not learn from experience,*
*we learn from reflecting on experience.’’*

*John Dewey, 1933*

Ruben van Weesep
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## SUMMARY

### Background

The construction industry has been notorious for its difficulty with organisational learning. In particular, sharing knowledge across projects and from the project to the organisation raises problems due to the project-based nature of organisations. Weak links between projects, project focus, geographic dispersity and the temporary nature raise barriers to learning. Consequently, organisations experience 're-inventing the wheel' and similar mistakes are made on different projects. Van Hattum en Blankevoort (VHB), a Dutch contracting firm, also experienced difficulties with learning across projects and recently adopted gate reviews to stimulate continuous learning. For each project, periodic gate reviews are held for intermediate project evaluation in which project members reflect on their work experiences. This collaborative reflection is noted by literature as a catalyst for organisational learning as it facilitates interactions between people and enables to externalize knowledge to share with others. Accordingly, the gate reviews might be valuable in facilitating organisational learning. However, in current literature, there is a lack of understanding about how the extent of reflection evokes organisational learning and which conditions influence the extent of reflection taking place. In particular, how the reflection process promotes organisational learning within project-based organisations such as in the construction industry. Therefore, the goals of this research are *(1) to provide insight into the extent of reflection and influencing conditions within the gate reviews, (2) its potential for organisational learning, and (3) to suggest how reflection can be promoted in the gate reviews in order to exploit the potential for organisational learning.*

### Methodology and theory

In this research, a multiple case study is conducted to provide an in-depth insight into the reflection occurring the gate reviews and its potency for organisational learning. It has done so by evaluating data of 6 cases against the developed conceptual framework which was operationalized for evaluation.
The framework developed based on (collaborative) reflection and organisational learning literature conceptualizes the extent of reflection with two dimensions. The first dimension focuses on the reflection process described by reflection stages. The distinguished stages of collaborative reflection are (1) articulating experience, (2) developing shared understanding, (3) collaborative re-evaluating experience and (4) drawing collective reflection outcome. The second dimension concerns the consideration 'depth' of the content, which is described by reflection intensities. The distinguished reflection intensities from a low intensity to a high intensity are (0) revisiting, (1) descriptive reflection, (2) dialogic reflection and (3) critical reflection. To understand how the extent of reflection is influenced, conditions are conceptualized regarding opportunity posed by the environment in which is reflected, the ability of participants to reflect and the motivation of participants to reflect. Moreover, to provide insight into the potential for organisational learning, reflection is conceptualized as an integrative power that stimulates two activities which lead to learning on the project level and organisational level. The first activity concerns linking to other project experiences and organisational knowledge during the reflection. The second activity concerns drawing lessons learned from the reflection, and these can be lessons for the project on which the reflection takes place or for the organisation.

### Results extent of reflection and influencing conditions

Using this framework to evaluate the cases, the results show that the extent of reflection varied across the cases in both the achieved stages of reflection and the reflection intensity. During the collaborative reflection, the participants articulated the experiences and developed a shared understanding of the experience the most. Evaluating the experience to understand what can be learned from the experience and subsequently drawing a collective reflection outcome occurred less during the gate reviews. Hence, during the reflection on less than half of the experiences, the participants performed all these stages and thus completing the reflection process.
The reflection content was during the gate reviews primarily considered at the lower reflection intensities. For the lowest intensity, revisiting, participants often only explained what happened without trying to understand the experiences. In the case of descriptive reflection, the participants did try to create meaning from the experience, however from a single perspective. In approximately 30% of all reflection cycles, the participants achieved dialogic reflection or critical reflection. In these reflections multiple perspectives were taken to understand the underlying roots of the experience, for the critical reflection the experience was also placed in the wider context of the organisation, questioning organisational assumptions.

The extent of reflection is influenced by various conditions regarding the opportunity, ability and motivation to reflect. Considering the opportunity, the reflection support provided by the facilitators guiding the gate review positively contributed to the extent of reflection. In particular when facilitators posed searching questions, it stimulated scrutinizing the underlying roots of the experience and enhanced the reflection. Within the ability category, the intrinsic motivation and learning attitude of participants positively influenced the extent of reflection, mainly when the project team experienced relatively much challenge on the project and when the gate review was prepared in advance by the project team. The participants' ability to communicate positively contributed to the reflection when mutual dialogue was held between project members because multiple views were then incorporated and existing interpretations challenged, enhancing the extent of reflection. Reflection experience, extrinsic motivation and the openness about mistakes did not considerably impact the extent of reflection. The available time during the gate reviews for reflection and trust between the participants did not notably affect the reflection. However, these are essential preconditions to enable collaborative reflection.

**Results integrative power of reflection**

Considering the potential of reflection stimulating organisational learning in project-based organisations, the results show positive findings. When the reflection is conducted at a higher extent, that is, conducting most of the reflection stages in particular collaborative re-evaluating and drawing conclusions, and at the higher intensities, the integrative power of the reflection also increases. During the reflection, experiences of other projects and organisational knowledge are used to make sense of the experience, give advice or emphasize the relevance of the experience were the participants are reflecting on. Through that process, experiences and knowledge become integrated between projects and the organisation. Additionally, experiences of the project are externalized during the reflection, and within an eight of all reflection cycles, these included lessons for the organisation. Subsequently, these lessons for the organisation are the initial impetus to address the problems on the organisational level.

**Recommendations to promote reflection in the gate reviews**

In order for VHB to increase the extent of reflection within the gate reviews, and consequently exploit the potential for organisational learning, several aspects of the conditions should be taken into account and emphasized. First, it is advised to guide the gate reviews with two facilitators to ensure attentive listening and focus on the dialogue. Also, the facilitators preferably have experience with similar projects as the one reviewed to enhance the reflection and to be able to link other project experiences more often. Second, training can be provided to the facilitators for asking searching questions, attentive listening, providing feedback and concluding a reflection outcome to increase the reflection support. Third, participants need to take time for reflection by predetermining the estimated time required to sufficiently discuss all topics. Fourth, during the gate review participants need to value and focus on what can be learned from experiences rather than regard it as a project progress evaluation. This requires emphasizing that the intent of the gate review is also to learn from experiences and to improve the project. Fifth, having the project team prepare the gate review in advance by enumerating what goes well and poor on the project, increases their motivation to reflect and subsequently achieve a greater extent of reflection. Finally, the gate review focuses primarily on the bad practices of the projects, however, good practices should also gain attention as these often provide fruitful lessons for the organisation.

**Conclusions**

In conclusion, during the gate reviews reflection takes place, however, the extent to which reflection is achieved primarily remains moderate as often not all reflection stages are performed and most reflections were conducted at the lowest two intensities. Nevertheless, when a high extent of reflection is achieved, this is mainly due to the opportunity provided and the motivation of the participants to reflect. Moreover, when a high reflection extent is achieved, lessons learned are frequently drawn for the organisation, and other project experiences and organisational knowledge are involved during the reflection. Therefore, promotes reflection, mainly with a high extent, organisational learning because through the participants of the collaborative reflection connections are established between projects and the organisation, leading to integration and institutionalization of knowledge. Hence, collaborative reflection in the gate review is valued as a fruitful approach for organisational learning within project-based organisations, such as VHB.

# SAMENVATTING


## Achtergrond

De bouwsector staat bekend om zijn moeilijkheden met organisatorisch leren. Met name het delen van kennis tussen projecten en van projecten naar de organisatie zorgt voor problemen vanwege het project gebaseerde karakter van de organisatie. Zwakke connecties tussen projecten, projectfocus, geografische spreiding en het tijdelijke karakter van projecten verhinderen leren als organisatie. Als gevolg hiervan ervaren organisaties het 'opnieuw uitvinden van het wiel' en worden soortgelijke fouten gemaakt op verschillende projecten. Van Hattum en Blankevoort (VHB), een Nederlandse aannemer, ondervind deze moeilijkheden met project overstijgend leren ook en hebben daarom onlangs gate-reviews geïmplementeerd om continu leren te stimuleren. Voor elk project worden periodiek gate reviews gehouden voor tussentijdse projectevaluatie waarin projectleden reflecteren op hun werkervaringen. Deze gezamenlijke reflectie wordt in de literatuur opgemerkt als een katalysator voor organisatorisch leren, omdat het interacties tussen mensen stimuleert en kennis beschikbaar maakt voor anderen. Daarmee kunnen de gate-reviews waardevol zijn voor het faciliteren van organisatorisch leren. In de huidige literatuur is echter een gebrek aan begrip over hoe de mate van reflectie organisatorisch leren stimuleert en welke condities de mate van reflectie beïnvloeden. Voornamelijk is het onduidelijk hoe het reflectieproces organisatorisch leren bevordert binnen project gebaseerde organisaties zoals in de bouwsector. Daarom zijn de doelen van dit onderzoek *(1) om inzicht te geven in de mate van reflectie en condities die de mate van reflectie beïnvloeden binnen de gate reviews, (2) de potentie van reflectie voor organisatorisch leren, en (3) om aan te bevelen hoe reflectie kan worden bevorderd in de gate reviews om de potentie voor organisatorisch leren te benutten.*

## Onderzoeksmethode en theorie

Om de doelen te bereiken wordt voor het onderzoek gebruik gemaakt van meervoudige casestudies. Dit is gedaan door 6 casussen te evalueren aan de hand van het conceptuele kader dat voor evaluatie is geoperationaliseerd.

Op basis van (gezamenlijke) reflectie en organisatorische leren literatuur is dit conceptuele kader opgesteld en conceptualiseren de mate van reflectie met twee dimensies. De eerste dimensie focust op het reflectieproces beschreven door reflectiefasen. De onderscheiden fasen van gezamenlijke reflectie zijn (1) uitspreken gebeurtenis, (2) begrijpen gebeurtenis, (3) gezamenlijk evalueren gebeurtenis en (4) gezamenlijk concluderen reflectie uitkomst. De tweede dimensie betreft de ‘diepte’ waarop de inhoud van de reflectie beschouwd wordt en is beschreven aan de hand van reflectie intensiteiten. De onderscheiden reflectie intensiteiten, van een lage intensiteit tot hoge een intensiteit zijn (0) terugblikken, (1) beschrijvende reflectie, (2) dialogische reflectie en (3) kritische reflectie. Om te begrijpen hoe de mate van reflectie wordt beïnvloed, zijn condities geconceptualiseerd met betrekking tot de gelegenheid die geboden wordt door de omgeving waarin wordt gereflecteerd, de vaardigheid van deelnemers om te reflecteren en motivatie van deelnemers om te reflecteren. Om inzicht te geven in de potentie voor organisatorisch leren, is reflectie bovendien geconceptualiseerd als een integrerende kracht die twee activiteiten stimuleert, welke leiden tot leren op projectniveau en op organisatieniveau. De eerste activiteit betreft het linken van andere projectervaringen en organisatiekennis tijdens de reflectie. De tweede activiteit betreft het trekken van geleerde lessen uit de reflectie voor het project waarop de reflectie plaatsvindt of het organisatieniveau.

## Resultaten mate van reflectie en condities

Aan de hand van het raamwerk zijn de casussen geëvalueerd, de resultaten daarvan laten zien dat de mate van reflectie tussen de casussen varieerde in zowel de bereikte reflectiefasen als de reflectie intensiteit. Tijdens de gezamenlijke reflectie spraken de deelnemers hoofdzakelijk gebeurtenissen uit en bediscussieerden deze om ze als groep te begrijpen. Het evalueren van de gebeurtenis om te begrijpen wat uit de ervaring geleerd kan worden en vervolgens het trekken van een collectieve reflectie-uitkomst kwam minder voor tijdens de gate reviews. Daarmee hebben de deelnemers tijdens de reflectie in minder dan de helft van alle ervaringen al deze fasen uitgevoerd en dus is in minder dan de helft het volledige reflectie proces doorlopen. De ervaringen zijn tijdens de gate review voornamelijk beschouwd op de lagere reflectie intensiteiten. Bij de laagste intensiteit, het terugblikken, legden de deelnemers alleen de ervaring uit zonder te proberen de ervaringen te begrijpen. Bij beschrijvende reflectie hebben de deelnemers wel geprobeerd om van de ervaring te leren, echter vanuit één perspectief. In ongeveer 30% van alle reflectie gevallen bereikten de deelnemers dialogische of kritische reflectie. In deze reflecties werden meerdere

perspectieven gebruikt om de oorzaken van de ervaring te begrijpen. Voor kritische reflectie werd tevens de ervaring in de bredere context van de organisatie geplaatst, waarbij de aannames van de organisatie in twijfel werden getrokken.
De mate van reflectie wordt beïnvloed door verschillende condities welke betrekking hebben tot de gelegenheid, vaardigheid en motivatie om te reflecteren. Met betrekking tot de gelegenheid droeg de reflectieondersteuning van de facilitators van de gate review voornamelijk positief bij aan de mate van reflectie. Vooral wanneer facilitators zoekende vragen stelden werd het onderzoeken van de oorzaken van de gebeurtenis gestimuleerd. Binnen de vaardigheidscategorie hebben de intrinsieke motivatie en leerhouding van deelnemers een positieve invloed op de mate van reflectie, hoofdzakelijk wanneer het projectteam relatief veel uitdaging op het project ervaart en wanneer de gate review vooraf door het projectteam was voorbereid. De communicatieve vaardigheden van deelnemers droeg positief bij aan de reflectie wanneer wederzijds dialoog tussen projectleden werd gevoerd, hierdoor werden meerdere standpunten vertegenwoordigd en bestaande interpretaties in twijfel getrokken. Gate review ervaring, extrinsieke motivatie en de openheid over fouten hadden geen aanzienlijke invloed op de mate van reflectie. De beschikbare tijd in de gate reviews voor reflectie en het vertrouwen tussen de deelnemers had geen noemenswaardige invloed op de mate van reflectie, echter worden wel gezien als essentiële voorwaarden om de gezamenlijke reflectie mogelijk te maken.

**Resultaten integrerend vermogen van reflectie**
Omtrent de potentie van reflectie om organisatorisch leren te stimuleren, laten de resultaten positieve bevindingen zien. Wanneer de reflectie in een hogere mate wordt uitgevoerd, dat wil zeggen, het uitvoeren van het merendeel van de reflectiefasen in combinatie met hoge reflectie intensiteiten, neemt ook het integrerend vermogen van de reflectie toe. Tijdens de reflectie worden ervaringen van andere projecten en organisatorische kennis gebruikt om de ervaring waarop gereflecteerd wordt te begrijpen, advies te geven of de relevantie te benadrukken van de ervaring gereflecteerd wordt. Door dat proces worden ervaringen en kennis geïntegreerd tussen projecten en de organisatie en worden geïnstitutionaliseerd in de organisatie. Bovendien worden door middel van reflectie ervaringen van het project beschikbaar gemaakt naar anderen en binnen acht van alle reflecties omvatten deze lessen voor de organisatie. Vervolgens zijn deze lessen voor de organisatie de eerste aanzet om de ervaring (bijv. problemen) op organisatieniveau aan te pakken.

**Aanbevelingen**
Om de mate van reflectie in de gate review te vergroten, en daarmee organisatorisch leren, moet aan verschillende condities aandacht besteed worden. Ten eerste wordt aan VHB geadviseerd om de gate reviews te begeleiden met twee facilitators om zo focus op de dialoog en reflectie te verzekeren. Bovendien hebben deze facilitators bij voorkeur ervaring met een soortgelijk projecten als het project waar de gate review wordt gehouden om zo andere projectervaringen te kunnen integreren in de reflectie. Ten tweede kunnen de facilitators worden getraind in het stellen van zoekende vragen, aandachtig luisteren, het geven van feedback en het trekken van een reflectie uitkomst om de reflectieondersteuning te vergroten. Ten derde moeten deelnemers tijd nemen voor reflectie door vooraf de geschatte tijd te bepalen die nodig is om alle onderwerpen voldoende te bespreken. Ten vierde moeten deelnemers tijdens de gate review beter inzien wat er geleerd kan worden uit ervaringen in plaats van de gate review te beschouwen als een evaluatie van de projectvoortgang. Dit kan gedaan worden door de intentie van het leren van ervaringen om het project te verbeteren te benadrukken. Ten vijfde, door het projectteam de gate review te laten voorbereiden middels het opsommen wat goed en slecht gaat in het project, vergroot dit hun motivatie om tot een grotere mate van reflectie te komen. Ten slotte richt de gate review zich primair op de slechte praktijken van de projecten, echter goede praktijken dienen ook aandacht te krijgen, aangezien deze vaak waardevolle lessen opleveren voor de organisatie.

**Conclusies**
Concluderend, tijdens de gate reviews vindt reflectie plaats, echter is de mate waarin reflectie bereikt wordt matig, aangezien vaak niet alle reflectiefasen plaats vinden en de meeste reflecties uitgevoerd zij op de laagste twee intensiteiten. Desalniettemin geldt dat als hoge mate van reflectie wordt bereikt dit voornamelijk tot stand komt door de geboden gelegenheid om te reflecteren en de motivatie van de deelnemers om te reflecteren. Bovendien worden bij het behalen van een hoge mate van reflectie vaak lessen getrokken voor de organisatie en worden andere projectervaringen en organisatiekennis bij de reflectie betrokken. Daarom bevordert reflectie, voornamelijk in een hoge mate, organisatorisch leren.

Door de deelnemers van de gezamenlijke reflectie worden verbindingen gelegd tussen projecten en de organisatie, wat leidt tot integratie en institutionalisering van kennis. Daarom wordt gezamenlijke reflectie in de gate reviews gezien als een waardevolle aanpak voor organisatieleren binnen projectmatige organisaties, zoals van Hattum en Blankevoort.

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# 1 INTRODUCTION

The construction industry has been notoriously known for its high failure cost and lack of innovation (Leicht & Harty, 2017; Love, Ackermann, Teo, & Morrison, 2015; Walker, 2016). Recent news articles still report high failure costs in the Dutch construction industry. van Heel, Buijs, and Wolf (2019) mention in their market research that construction companies estimate their failure costs at least 5% of total expenditure. Similarly, Koenen (2019) studied problematic projects in the Dutch construction industry and argues that the total failure cost of all projects was approximately half a billion euros in 2018. Amongst others, Koenen (2019) argues that one of the causes of high failure costs is that the industry insufficiently learns from mistakes.

Furthermore, Blayse and Manley (2004) studied innovation in the construction industry and noted that the traditional industry has difficulties with the successful development and use of innovative solutions. The literature emphasizes the importance of knowledge for developing innovations (P. Davis, Gajendran, Vaughan, & Owi, 2016). Incorporating new knowledge into services, processes and products is even used as a definition for innovation (Afuah, 2003). Hence, a firm's ability to learn by developing, distributing and using knowledge seems to determine the innovativeness of an organisation. However, the industry is also known for its difficulties to share knowledge, and hence innovation is hampered (Winch, 1998).

The lack of innovation and high failure cost imply that the construction industry struggles with learning and sharing knowledge within the organisations, literature therefore notes that the industry lacks organisational learning (e.g. Siriwardena (2015); Swan, Scarbrough, and Newell (2010)). Organisations seem to be caught in the 'learning paradox of projects' (Bakker, Cambré, Korlaar, & Raab, 2011). On the one hand, projects are regarded as fertile ground for creating experiences and learning because of their transience and inter-disciplinary nature (e.g. Ayas and Zeniuk (2001); Gann and Salter (2000); Grabher (2004)). On the other hand, the potential for learning from the projects as an organisation is tempered because the project-based nature poses difficulties for sharing the knowledge to the organisation to become institutionalized (Bartsch, Ebers, & Maurer, 2013). Consequently, knowledge generated in projects is not available to subsequent projects and these will start anew instead of learning from prior projects (Mainga, 2017).

Although efforts are made to address these problems, organisations in the construction industry still experience difficulties with organisational learning. This is also the case at Van Hattum en Blankevoort (VHB) a large Dutch contractor in the construction industry. As explored in the next chapter, VHB experiences problems with organisational learning and wants to overcome the problems.

## 1.1 Organisational learning at Van Hattum en Blankevoort

Van Hattum en Blankevoort (VHB) is a medium-sized Dutch civil contractor and is a subsidiary of VolkerWessels, the largest contractor in the Netherlands. VHB its core business focusses on realizing concrete infrastructure (e.g. viaducts, locks, tunnels) and executing the associated project management tasks. In the past few years, VHB noticed that the organisation and their employees struggle with learning and sharing knowledge within the organisation. It was observed that similar mistakes on different projects were frequently made, so learning from previous mistakes did not happen. Moreover, in projects, it is experienced that knowledge is not always presently available at the person who needs that knowledge while others do possess that knowledge. Hence, it is questioned whether knowledge is sufficiently shared throughout the organisation and if the organisation learns from the knowledge possessed by individuals to let the whole organisation benefit from the knowledge.

The effects for VHB as a result of insufficient organisational learning are far-reaching. First, the lack of sharing knowledge across projects results in reinventing the wheel; employees try to find solutions themselves while others can provide them with previously gained knowledge. Hence, working practices within the organisation are not always efficient. Second, the difficulty with learning from mistakes increases the risk of cost overruns due to failure costs. Third, the organisation is more vulnerable to external changes when it cannot adjust to these changes due to poor learning. This also reduces the competitive advantage of the firm when it learns less quick as its competitors. Ultimately, these effects might negatively influence the financial performance of the organisation.

Due to the struggle experienced with learning and knowledge sharing, the management of VHB recently announced the strategic goal to facilitate structural learning and continuous development in the organisation. To achieve this goal, VHB developed and adopted the 'gate review procedure' (GRP). The

procedure consists of eight stages throughout the span of the project, for each stage a review is conducted about the project. Information for the review is acquired by letting the project team reflect upon their actions in a collective interview. A more elaborate description of the gate review procedure is included in section 3.2. The GRP serves multiple purposes: project evaluation, enable uniform working across projects, and facilitating structural learning and sharing knowledge. The latter purpose is of interest for this research because the management of VHB initiated the procedure intending to contribute to structural learning and sharing knowledge. Hence, management wants to know whether the GRP is capable of stimulating learning. Additionally, management is interested in how the GRP potentially can be improved in order to achieve the strategic goal to facilitate structural learning and continuous improvement.

### 1.1.1 Factors hindering organisational learning

Current literature provides some factors why a project-based organisation like VHB cannot reap the benefits of organisational learning. In other words, the context in which VHB operates their business makes it complex to learn and share knowledge within the organisation. VHB's work is, similar to other construction companies, organized around projects to serve multiple clients who demand highly differentiated and customized products, and thus can be characterized as a project-based organisation (Dubois & Gadde, 2002). This project-based nature affects learning and knowledge sharing at VHB in four ways (Ren, Deng, & Liang, 2018). First, projects are often perceived as unique by project members and these are therefore less likely to share gained knowledge to other parts of the organisation because they do not see the added value of sharing the knowledge to subsequent projects (Moud & Abbasnejad, 2012). Hence, project members lack intrinsic motivation to share experiences. Second, projects are fragmented in time and have a temporary nature. When a project is finished there is a severe risk of knowledge loss to the organisation (Zhao, Zuo, & Deng, 2015). Moreover, knowledge can hardly become embedded in the organisation since there is limited time available to transfer the knowledge to the organisation (Scarbrough et al., 2004). Additionally, when the project dismisses, project members are often allocated to new projects without effective and timely knowledge sharing within the organisation and with other projects (Lindner & Wald, 2011; Ruuska & Vartiainen, 2005). For instance, employees are often not able to conduct a proper project evaluation in which experiences can be made explicit to the organisation. Even when project evaluation is performed it is conducted at the end of the project, making it difficult for employees to recall experiences which happened at the beginning of the project. Also, projects executed parallel in time are less likely to benefit from the experiences learned in the early phases of the project when there is only an evaluation at the end of the project. For example, when valuable insights are gained at the beginning of a project and these are only shared with the organisation at the end of the project, other projects cannot benefit from this knowledge while the project still lasts. Hence, the long learning cycles of projects impede quick learning. Third, projects are geographically dispersed and longer-distances between projects hamper the exchange of knowledge (Ren et al., 2018). It weakens the formal links between projects and organisation, and hinders social interactions between employees to share their knowledge. Finally, projects are executed under time constraints and therefore employees are project goal and tasks oriented, giving less priority to other tasks that do not directly contribute to projects tasks such as learning and knowledge sharing (Newell, Bresnen, Edelman, Scarbrough, & Swan, 2006; Swan et al., 2010). When learning and knowledge sharing are not embedded as part of the working process, and thus do not contribute to achieving project tasks, it likely receives less attention (Hartmann & Dorée, 2015).

### 1.1.2 The potency of the Gate Review Procedure to enhance organisational learning

Although the project-based nature of VHB's operations poses challenges to learning as an organisation and share knowledge, the GRP is from a theoretical perspective fruitful to enhance organisational learning. More specifically, the procedure seems to deal with the circumstances of the construction industry nature and might, therefore, be a worthwhile approach to stimulate organisational learning. First, the GRP is embedded within the project context and mandatory for the majority of the projects. The procedure is, therefore, part of the work process of the project and overcomes that learning gets less priority due to project pressure (Ayas, 1996; Swan et al., 2010). Second, the procedure strengthens the formal link between projects and the organisation because the outcomes of the gate reviews are shared with the management of the organisation. Third, the GRP facilitates intermediate project evaluations enabling short learning cycles throughout the project, reducing knowledge loss during the project. Finally, perhaps the most important potential contribution of the GRP to organisational learning is the opportunity for collaborative reflection. Hartmann and Dorée (2015) argue that through interactions knowledge is shared, which is essential for organisational learning. Reflective discourse facilitates the interaction between team

members and lets them reflect upon work experiences to create meaning from them. This leads to a better understanding of one's work and can guide future behaviour. Moreover, reflection on work-practice can identify and make 'best practices' and lessons learned' explicit to the organisation. Reflection is therefore regarded as a driving force of organisational learning since it might integrate knowledge within the organisation (Knipfer, Kump, Wessel, & Cress, 2013). In other words, the reflection process is due to the ability to integrate knowledge an important catalyst for transforming daily work experience into individual, team and organisational learning (Høyrup, 2004; Järvinen & Poikela, 2001; Knipfer et al., 2013; Moon, 1999).

### 1.1.3 Problem scope

The problems with organisational learning at VHB are extensive and can be addressed in various ways. Yet, this research focusses on the GRP because the procedure is recently adopted and aims to facilitate learning and sharing knowledge. Hence, the research does not study other purposes of the GRP, like project control. Moreover, the GRP is of interest due to its expected potential to stimulate organisational learning. Reflection is the major aspect of theoretical potency to stimulate organisational learning. Therefore, this research focusses on the reflection facilitated in the GRP in order to stimulate organisational learning at VHB.

## 1.2 Research objective

The research is characterized as practice-oriented since it is constructed around a practical problem of a private organisation. The research aims to provide insights into current practices and to suggest improvements to cope with the problem. In this case, the challenges experienced by the management of VHB with learning and sharing knowledge. Correspondingly, the objective is twofold, distinguishing the split between providing insight into current practices and recommending improvements. Based on the research problem and the theoretical assumption that reflection enhances organisational learning, are the research objectives defined as:

> *(1) to provide insight into the extent of reflection and influencing conditions within the gate reviews, (2) its potential for organisational learning, and (3) to suggest how reflection can be promoted in the gate reviews in order to exploit the potential for organisational learning.*

The first objective aims to provide insight into how much reflection takes place within the gate review and to understand which and how conditions of the gate reviews influence the extent of reflection taking place. The second objective aims to provide insight into how reflection enables the integration of knowledge to promote organisational learning. The third objective aims to provide advice to VHB how reflection can be enhanced within the gate reviews to exploit the potential for organisational learning.
Reflection is in this research understood as an individual and collaborative process consisting of multiple stages through which meaning is created of experiences, resulting in new or changed cognition, behaviour or action. The understanding of organisational learning in this research is mainly adopted from Crossan, Lane, and White (1999), and is regarded as the process of change in individual and shared thought and action in an organisation, which is embedded in and affected by the institutions of the organisation. The precise understanding of reflection and organisational learning, as well as the relationship between both concepts, is presented in the literature review in chapter 2.

## 1.3 Research questions

The research can be characterized as both descriptive and exploratory research. On the one hand, the research tries to describe to what extent reflection currently occurs in the gate reviews. A descriptive research approach is taken to gather data about the characteristics of topics of interest, in this case, the gate reviews and the occurring reflection. On the other hand, an exploratory research approach is used to understand the conditions present in the gate review procedure influencing the extent of reflection, the potential of reflection for organisational learning and how the gate reviews can be arranged to promote reflection. Exploratory research is needed since there is not much known about how conditions within the gate reviews influence reflection, how reflection within project-based organisations promotes organisational learning or how gate reviews can be arranged to promote reflection.
Taken the research objective and approach into consideration the research questions are defined as follows:

1. *To what extent does reflection take place during the gate reviews and which conditions influence the extent?*
2. *What is the integrative power of reflection in order to promote organisational learning in project-based organisations?*
3. *How can reflection be promoted within the gate reviews in order to exploit the potential for organisational learning?*

In order to answer these questions multiple case study research is employed as a strategy to conduct the research. This allows us to get a profound insight into the current practices of reflection in the gate reviews and its potency for organisational learning. The gate reviews are observed to determine the extent of reflection and its potential for organisational learning. Additional, interviews are held to determine the influence of the conditions and how reflection can be promoted. The research methodology is further elaborated in chapter 3.

## 1.4 Research contributions

***Practical relevance***

As elaborated in the introduction, learning and sharing knowledge in organisations of the construction industry is complex and considered immature. Mainga (2017) and Söderlund, Vaagaasar, and Andersen (2008) note that only few firms are able to systematically identify, accumulate and transfer new insights from projects to the organisation or other future and concurrent projects. Hence, they emphasize the need for structural approaches to facilitate learning in project-based organisations. Accordingly, this research might provide directions on how organisations can increase their ability for learning by providing insight into if and how reflection can contribute to organisational learning. However, the practical relevance of the research is mainly limited to VHB. It provides VHB insight into how they can potentially increase their learning practices by enhancing the exploitation of reflection in the GRP. Hence, the research contributes to the achievement of the goal to structurally facilitate learning and knowledge sharing in the organisation.

***Academic relevance***

Although organisational learning in the construction industry has been studied extensively in the past two decades, this research contributes to the existing literature in two ways. First, the research establishes an in-depth study of collaborative reflection processes as a promotor of organisational learning. Several studies have argued that reflection supports or is a key process of organisational learning (e.g. Knipfer et al. (2013); Krogstie, Prilla, and Pammer (2013)), however, to my understanding, none of these studies investigated how reflection processes in an organisational context are established and how the extent of reflection impacts the potential for organisational learning. More specifically, Hartmann and Dorée (2015) argue that reflective discourse is fruitful to make experiences explicit in project evaluations to other members and higher management in the construction industry. Additionally, they suggest that reflection contributes to organisational learning because it assists the institutionalizing of knowledge, and thus seem to facilitate for cross-project learning. However, more research is needed to understand the reflective practices in the construction industry, to provide insight into the degree of reflection that can be achieved in (intermediate) project evaluation. Moreover, to understand how reflection organized in a structural procedure enables learning across projects. Second, the research explores how reflection can be employed in project evaluation as a catalyst for organisational learning. Again, many studies have acknowledged the use of reflection for organisational learning, however, few to none describe how reflection can be utilized to achieve this. This research aims to provide insight into what conditions to consider when reflecting during project evaluations and which steps should be taken to achieve fruitful reflection.

## 1.5 Readers guide

This first chapter introduced the topic and discussed the research objective and questions. The following chapter presents the theoretical foundation, elaborating on the conceptual framework of the research. Thereupon, in chapter three, is the methodology for conducting the research explained. Chapter four presents the results of the multi-case study, separated into the within-case results and the cross-case results. Chapter five discusses the results and reflects on the conceptual framework and methodology. Chapter six presents the recommendations to VHB how reflection can be enhanced in the GRP. Finally, chapter seven provides the conclusion of the research and suggests directions for future research.

# 2 THEORETICAL FOUNDATION

This chapter presents the theoretical foundation of this research, covering several topics of interest for this study. The chapter establishes the conceptual framework of the research elaborating the understanding of reflection, organisational learning and the relationship between them, taking the construction industry in regard.

## 2.1 Organisational learning

Even though there is not much consensus about the precise definition of organisational learning, most authors acknowledge that organisational learning includes a process in which organisational knowledge is enhanced (Argyris & Schön, 1996; Easterby-Smith & Lyles, 2011). In this research, the definition of organisational learning is adopted from Vera, Crossan, and Apaydin (2011):

> *Organisational learning is the process of change in individual and shared thought [i.e. cognition] and action [i.e. behaviour], which is affected by and embedded in the institutions of the organisation. When individual and group learning becomes institutionalized, organisational learning occurs and knowledge is embedded in non-human repositories such as routines, systems, structures, culture, and strategy.* (p. 153)

The first sentence of this definition emphasises that learning is a social process which is subjective to the context of the organisation. More specifically, learning is an iterative process that shapes and is shaped by the organisation where the learning occurs. This includes that there is a relation between how new knowledge is assimilated (exploration) and that knowledge already known is utilized (exploitation) (Bontis, Crossan, & Hulland, 2002). The second part of the definition acknowledges that organisational learning is a system, in which knowledge continually evolves from the individual to groups and eventually becomes embedded within the organisation. Subsequently, the embedded knowledge of the organisation constitutes the organisation's strategy formulation and the implementation of the strategy.

The 4I framework of Crossan et al. (1999), shown in figure 1, describes the process of evolving knowledge within the organisation. The framework is a well-established construct within organisational learning literature. In their framework, Crossan et al. (1999) defined four social and psychology-related processes that facilitate organisational learning: intuiting, interpreting, integrating and institutionalizing. These processes occur on three different levels where learning happens: the individual, the group and the organisation.

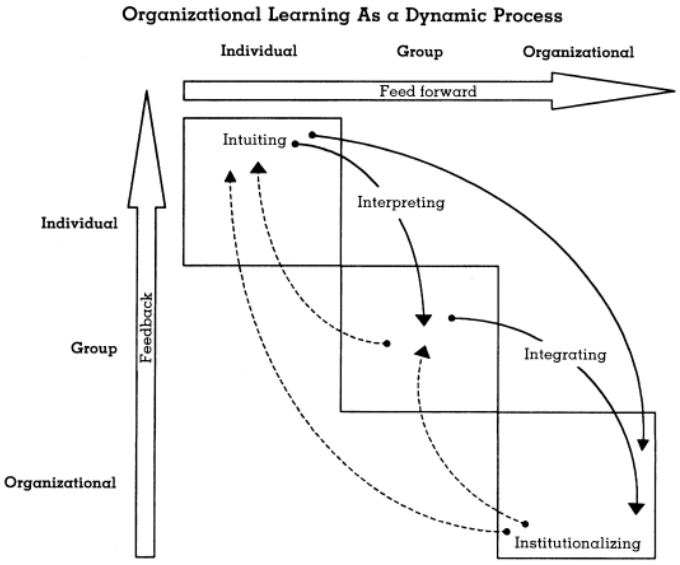


**Figure 1: 4I framework (Crossan et al., 1999)**

This first stock is the individual level, here learning consists of processes of intuiting and interpreting. It focusses on the generation of new ideas, insights, knowledge and taking action in order to cope with the changing environment and undertake required tasks. On the group level, learning is conceived as sharing interpretations of individuals to develop mutual understanding and common actions. The group then explores complex issues from multiple perspectives by social interactions like continuing conversations. Thus, learning on the group level is about the process of integrating multiple views to develop mutual understanding. In the final level, the organisational level, learning is more than mutual understanding. On this level, it is about translating the understanding into new procedures, processes, structures, products and strategy that become embedded within the organisation. According to Crossan et al. (1999) knowledge is not human specific anymore, but settled in its roots, hence if employees leave the knowledge is still available to the organisation.

## 2.2 Knowledge sharing within project-based organisations

Closely related to organisational learning and often debated in literature is knowledge sharing within project-based organisations (PBO), in particular across projects (e.g., Bartsch et al. (2013); Hartmann and Dorée (2015); Ren et al. (2018); Zhao et al. (2015)). Sharing knowledge within project-based organisations is in literature often noted as 'inter-project learning', 'project to project learning' or 'cross-project learning (Brady & Davies, 2004). Mainga (2017) emphasizes that inter-project learning consists of two elements; (1) the acquisition and development of new insight and knowledge within processes and activities undertaken during the project, and (2) the transfer of such new insights and knowledge to other projects within the organisation. Moreover, Hartmann and Dorée (2015) suggest that learning from projects takes place within projects, and accordingly suggest to learn across projects more attention should be given to learning within the project. Thus, they, amongst others, suggest that reflection is a salient approach to become aware of their experiences and make them explicit to others (Høyrup, 2004; Knipfer et al., 2013; Kolb, 1984).

Considering inter-project learning in the light of the 4I framework of Crossan et al. (1999) sharing knowledge across project seems essential. To achieve organisational learning within a PBO, mainly the processes of integrating and institutionalizing are more complex. Within PBO project teams can be perceived as groups and interpreting primarily happens on the project by sharing ideas and knowledge within the project. However, to integrate the knowledge from one project to another (the organisational level) project boundaries have to be crossed by sharing knowledge across projects. As elaborated in section 1.1.1 several causes hinder the sharing of knowledge across project due to the project-based nature, making the integration process more complex. Nevertheless, to achieve organisational learning the integration step remains essential within a PBO, and thus sharing knowledge across projects is essential.

Therefore, does this research suggest that the potential for organisational learning is enhanced by acquiring and developing new insights and knowledge within the project and subsequently sharing new insight and knowledge to other projects within the organisation. In this regard, are experiences obtained within the project a starting point for organisational learning, the next section explores how one can learn from experience.

## 2.3 Learning from experience

Reflection on work experiences as an integral part of work practices is considered as an important aspect for continuous improvement and learning (Wain, 2017). More specifically, several authors argue that reflection is a fruitful approach to learn in an organisational context (e.g. Hilden and Tikkamäki (2013); Høyrup and Elkjær (2006); Knipfer et al. (2013); Swieringa and Wierdsma (1990)). This is because reflection is a process which enables to create meaning from experience.

Two models that emphasize that reflection is essential to interpret the meaning of experience are those of Boud, Keogh, and Walker (1985) and Kolb (1984). Both studies base their ideas on the notion of reflective thinking from Dewey (1933). Dewey (1933) defined reflective thinking as: "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends [that] includes a conscious and voluntary effort to establish belief upon a firm basis of evidence and rationality" (p. 188). According to this definition, the concept of reflective thinking is a skill to change knowledge for a specific purpose by questioning the ground of that knowledge (Balzert, Fettke, & Loos, 2011). Also, reflective thinking is regarded as an approach to problem-solving because it is a complex process in which an individual tries to recognize a problem and find its solution (Mackintosh, 1998). Although Dewey (1933) provided fundamental thoughts on reflection, his conceptualization mainly focused on a thinking style rather than as a mean for learning (Knipfer et al., 2013). Both Boud et al. (1985) and Kolb (1984) extend the view of Dewey and argue that the outcome of reflection is learning. Figure 2 depicts how experience, reflection and the application of the reflection outcome are related and shows how one can learn from experience.

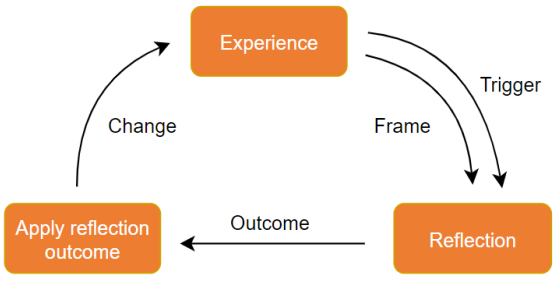


**Figure 2: Reflective learning (boud, 1985; Kolb, 1984)**

Reflective learning starts with an *experience* one has of a certain event or situation. More precisely, what one does, feels, thinks and concludes of a certain event directly during the event or immediately after. Therefore, is the subject of reflection someone's experience and in an organisational context likely a work-related experience. Thus, the *frame* for reflection is set by the conceptual understanding one has of the experience. Subsequently, the reflection process is initiated after this is triggered. Even though the initiation of the reflection process is not explicitly included in the notions of Kolb (1984) and Boud et al. (1985), other authors do emphasize that reflection must be triggered by something before it is initiated because not all experiences automatically result in reflection (e.g. Høyrup and Elkjær (2006); Knipfer et al. (2013); Prilla, Pammer, and Balzert (2012)). Routinized actions and habits can be considered as experiences however do not stimulate reflection. When a routine is disturbed or standard actions inhibited, uncertainty can be experienced that triggers reflection to find a solution to reduce the uncertainty. Other authors have referred to triggers of reflection as puzzlement, perplexity, and surprise (Schön, 1987; Yanow & Tsoukas, 2009). These cues for the initiation of reflection can be characterized as internal, nevertheless, reflection can also be triggered externally. For example, a reflection session is initialized by stakeholders, who have an interest in acquiring insight from others, in which others participate and generate the outcome.

Once triggered, the *reflection* process starts. During the reflection process individuals deliberately tries to create distance from the experience to remember what happened without having to act accordingly. Hence, during reflection, there is a split between action and thinking which is crucial to enable sensemaking of the experience and generate meaning (Høyrup, 2004). Accordingly, the re-evaluation of the experience takes place in which individuals associate new knowledge with that which is already possessed to integrate it into the individual's mental model (Boud et al., 1985). As a result, the individual learns by adding this knowledge to their repertoire of behaviour.

Finally, the potential *outcome* of the reflection process regards new insights about experiences, change in behaviour or commitment to action (Boud et al., 1985). Kolb (1984) refers to the outcome of reflection as abstract conceptualisation in which a 'new theory' or modification on an existing concept is established from which actions can be deduced for active experimentation. Subsequently, the outcome of reflection can be applied; this experimentation allows to test new ideas in a situated context and generates new *changed* experiences (Krogstie et al., 2013).

## 2.4 Conceptualization of reflection

The previous section provided a general understanding of the reflection process, however, in order to determine the extent of reflection it should be further conceptualized. Yet as Tsingos, Bosnic-Anticevich, Lonie, and Smith (2015) note many researches acknowledge the complexity of assessing the reflection process. Many studies tried to define or conceptualize the reflection process for different applications and disciplines. Consequently, there is a lack of coherence in the understanding of the complex phenomenon of reflection and associated concepts are sometimes faultily interchanged (Justice et al., 2019). Therefore, as Balzert et al. (2011) argue, reflection must be conceptualized in relation to the respective scope of its use, in this case, collaborative reflection with the intent to promote organisational learning.

Both unidimensional and multidimensional approaches have been taken to conceptualize and assess reflection. Frequently used dimensions are stages of the reflection process and levels or depth of the reflection (e.g., Jung and Wise (2020); Kember, McKay, Sinclair, Wong, and Education (2008); Wong, Kember, Chung, and CertEd (1995)). The stages of reflection often build upon the work of Boud et al. (1985) and consider items as reviewing an experience, analysis and reflective outcome (Koole et al., 2011). The level or depth of reflection ranks reflection ranging from non-reflective to critical reflection and often builds upon the work of Mezirow (1990) and Hatton and Smith (1995) (e.g., Gulwadi (2009); Jensen and Joy (2005)). This research refers to this dimension of levels and depth as reflection intensity. Tsingos et al. (2015) argue that combining both dimensions lead to a deeper understanding of the reflection taking place. Hence, this research adopts both dimensions to conceptualize reflection. The next two sub-sections (2.4.1 and 2.4.2) elaborate on the reflection stages and reflection intensities.

### 2.4.1 Stages of individual and collaborative reflection

Although the conceptualizations of reflection by Kolb (1984) and Boud et al. (1985) are explicitly aimed at the individual perspective, the collective perspective should not be neglected. In particular, the consideration of collective reflection is important in an organisational context and to achieve organisational learning. Raelin (2002) argues that not only own (work) experiences are valuable to reflect upon to learn but also, the experiences of others are valuable to collectively learn at the workplace. Sharing experiences and engaging in collective reflection allows to validate and develop our personal knowledge, actions, plans and assumptions through the review of others. As a result, individual and collective learning occurs.
Knipfer et al. (2013) argue that collaborative reflection should be considered to a greater extent in an organisational context in order to understand how individuals engage in collective reflection. Accordingly, they present a model of how collective and individual reflection are intertwined in a reciprocal process, figure 3 presents a slightly adapted version their model and sets the basis for the conceptualization of collective reflection in this research.

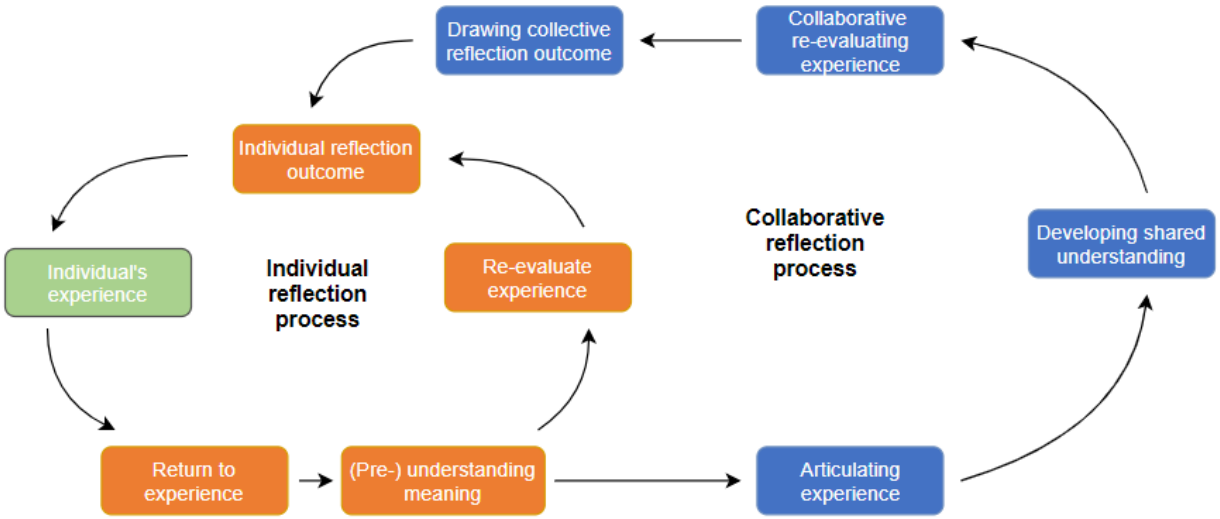


**Figure 3: Individual and collective reflection processes, slightly adapted from Knipfer et al. (2013)**

The goal of the collaborative reflection is reaching a collective outcome about work-related experiences which sequentially leads to learning. Experiences are often subjective, so first individuals articulate their pre-understanding of the (collective) experience. Individuals then negotiate about the experience of what happened, resulting in a shared understanding of the experience frame. Thereafter, the group collectively interprets and makes sense of the experience. In other words, the collaborative meaning-making of the experience. Subsequently, the participants of collaborative reflection reach a shared reflection outcome in which they draw a conclusion and/or plan for action. The shared reflection outcome then feedbacks into the individuals, and thereby enrich their insights of the experience. Hence the collaborative and individual reflection process are intertwined, and thus individuals can through collective reflection learn to a greater extent (Knipfer et al., 2013).
Each distinguished stage is characterized by certain reflection activities which are elaborated in the enumeration below.
*Individual reflection process:*

- *Returning to experience.* Describe or reconstruct the experience, attend emotions and describe rationales for the event (Boud et al., 1985; Dewey, 1933; Gibbs, 1988; Korthagen, Vasalos, & Trainingen, 2002; Moon, 1999; Tigelaar, Dolmans, Meijer, de Grave, & van der Vleuten, 2008).
- *(Pre-)understanding meaning.* In consideration of the reflection topic, relate the experience to the relevant context (Krogstie et al., 2013; Prilla et al., 2012). Develop a hypothesis about the possible causes of the event (Dewey, 1933; Woerkom, 2003).
- *Re-evaluating experience.* Reviewing the experience (Moon, 1999; Woerkom, 2003). Linking the experience to relevant prior experiences and knowledge (Daudelin, 1996), to detect patterns (Boud et al., 1985), validate the hypothesis (Dewey, 1933) and make sense of the experience (Gibbs, 1988).

- *Drawing individual reflection outcome.* Drawing conclusions from the experience which lead to new perspectives, change in behaviour, enriched understanding or action (Boud et al., 1985).

*Collaborative reflection process:*

- *Articulating experience.* Participants articulate and make available how they understand the experience by describing their experience of the event and how they feel about the experience (Krogstie et al., 2013; Prilla, Nolte, Blunk, Liedtke, & Renner, 2015). Moreover, during the expression of the experience, the participants elaborate on the contextual factors influencing the experience. As the participants express their opinion on the experience it should become clear if the experience regards a good practice or bad practice.
- *Developing shared understanding.* Participants discuss what the experience is to reach a shared understanding of the experience, this sets the collective frame for evaluating the experience (Krogstie et al., 2013; Prilla et al., 2015). During the discussion, a justification for the event can be given, providing the rationalises of the event.
- *Collaborative re-evaluating experience.* Participants critically evaluate the experience by referring to prior experiences and knowledge (Daudelin, 1996), detecting patterns (Boud et al., 1985), challenge groupthink (Woerkom, 2003) and interpret the meaning of the experience (Krogstie et al., 2013; Prilla et al., 2015). In order to make sense of the experience, prior knowledge or experiences should be linked to the experience on which is reflected. Additionally, to detect the patterns the causes and effect should be explored to get a profound understanding of the experience. Evaluating the experience from multiple perspectives, considering alternative explanations and posing searching questions stimulate to explore and interpret the meaning of the experience. Moreover, challenging existing interpretations of how the experience should be understood enhances the evaluation of the experience.
- *Drawing collective reflection outcome.* Participants agree on what the satisfactory outcome is of the re-evaluation. Resulting in, a better or different understanding of experiences, new perspectives, changes in behaviour or plan for action (Boud et al., 1985; Krogstie et al., 2013; Prilla et al., 2015). During the final stage activities as giving advice or proposing solutions indicate there is a reflection outcome. Moreover, to turn the reflection outcome into learning and actual behaviour the participants can plan for actions or translate the newly gained insight into behaviour during the reflection.

### 2.4.2 Intensity of reflection

Although reflection can be fruitful for translating experience into insight and create meaning, the ‘intensity’ of reflection and the outcome might vary. This research understands the ‘intensity’ of reflection according to the study of Fleck and Fitzpatrick (2010). That is, the intensity of reflection is the ‘depth’ or ‘impact’ in which reflection and its outcome are achieved. Moreover, the concept of reflection intensity is within some literature linked to the concepts of loop learning, critical reflection and relexify (Høyrup, 2004).
The study of Hatton and Smith (1995) and Fleck and Fitzpatrick (2010) describe the intensity of reflection more explicit. This research adopts their view on the reflection intensity and associates it with the concepts of loop learning, critical reflection and relexify. The enumeration below shows which intensities of reflection can be distinguished, in which intensity zero is the least reflection and intensity three achieves the highest level of reflection.

0. *Revisiting.* Solely describing an experience without further explanation. This first intensity is not considered as reflection and thus noted as level 0.
1. *Descriptive reflection.* Description of the experiences including explanation and justification of actions or interpretation. Nevertheless, expressed descriptively without exploring alternative explanations (Lee, 2005) and taking one perspective (Ward & McCotter, 2004). This intensity shows a limited extent of reflection, and according to some authors this is still not considered as reflection (e.g., E. A. Davis (2006))
   This intensity can be considered as single-loop learning. Argyris (1999) has defined single-loop learning as: “an error is detected and corrected without questioning or altering the underlying values of the system’’ (p. 68).
2. *Dialogic reflection.* Deliberate ‘stepping back’ from the experience to ponder (Daudelin, 1996) and identifying critical incidents (Muir & Beswick, 2007). It mainly involves reflecting from multiple perspectives seeking alternative explanations and searching for relationships between prior

knowledge and experience to generalize from them and reach an enriched understanding from the experience.
This intensity can be considered as double-loop learning. Double-loop learning concerns challenging assumptions and emphasizes taking multiple perspectives for questioning if one is doing the right things (Argyris, 1999).

3. *Critical reflection.* The scrutiny and critique of the presuppositions on which our beliefs have been built (Mezirow, 1990). Or according to Reynolds (1998), questioning 'contextual taken-for-granted' assumptions; achieving fundamental change by challenging and questioning assumptions resulting in changed understanding or behaviour. Additionally, considering the wider picture; taking into account how actions influence the environment we act in (McGregor & Cartwright, 2011). This reflection intensity is closely related to the concept of *reflexivity* (Thompson & Pascal, 2012). Similar to critical reflection, reflexivity is defined by Loeber, Mierlo, Grin, and Leeuwis (2007) as: ''critical scrutiny of things that are usually taken for granted, in such a way that their historically grown self-evidence (path dependency) is challenged'' (p. 84).
Additionally, Triple-loop learning questions if actions are based on the right rationales, and thus queries values and norms. This can also be related to the concepts of critical reflection and reflexivity and therefore is associated with the third intensity of reflection.

Although these reflection intensities can be distinguished, it is complex to clearly define the boundaries of them (Sumsion & Fleet, 1996). Therefore, should the intensity be regarded as rough indications of the reflection 'depth' and the boundaries between the intensity levels as blurred. Moreover, a higher reflection intensity is not necessarily better than a lower intensity level. The proper reflection intensity for the consideration of experiences depends on the nature of the problem or experience on which people reflect. For example, simple problems do not always require changing values and norms and might even be better solved within current assumptions rather than changing them. Hence, choosing the right intensity of reflection for a certain problem or experience is of importance.
Even though categorizing intensities of reflection has limitations, distinguishing activities and behaviours associated with different intensities of reflection is useful to evaluate the extent of reflection occurring, however, with careful consideration (Fleck & Fitzpatrick, 2010).

## 2.5 Conditions influencing the extent of reflection

The extent to which reflection is utilized, and consequently the degree to which participants learn, is influenced by several conditions. These conditions concern both the environment in which the reflection is conducted and personal conditions related to the participants. The conditions are categorized into three main topics, namely: opportunity, ability, and motivation to reflect (Kelloway & Barling, 2000).
***Opportunity*** concerns conditions posed by the environment in which participants engage in collaborative reflection and the project environment in which the participants collect their experiences. Reflection takes *time,* hence, to engage in reflection sufficient time must be available (Moon, 1999; Wallman, Lindblad, Gustavsson, & Ring, 2009). When hasting one will likely not fully benefit from reflection because taking multiple perspectives is easily overlooked and reflection will not be thoroughly be executed (Groen, 2015). Since reflection is a developmental process, *support* or *guidance* to conduct proper reflection is seen as a driver (Eraut, 2004; Fleck & Fitzpatrick, 2010). Additionally, in collaborative reflection guidance can provide structure in reflection so the learning goal can be achieved more efficiently. The so called facilitators who provide the support for reflection can encourage the participants to fully explore the experience and thereby increase the quality of the reflection (Koole et al., 2011). *Challenge* in work is a condition for reflection of the project environment because challenges in work provide opportunities to create experiences outside someone's comfort zone (Eraut & Hirsh, 2010). The challenge in work combined with flexibility and creativity are fertile ground to learn by reflection (Kump et al., 2011).
***Ability*** concerns the personal determinants of the reflector and can be noted as their skills to reflect. The mental capability of *abstract thinking* is an essential skill to create distance from the experience, take a helicopter view, explore causes and effects and draw conclusions from experience (Groen, 2015). Joint negotiation and re-evaluating in collaborative reflection requires *communicative* skills (Knipfer et al., 2013). The discussion during collaborative reflection greatly depends on the communications skills of participants to elaborate on the experiences and for others to listen. Moreover, *openness about mistakes* is essential for reflection to be genuine and valuable (de Groot, Endedijk, Jaarsma, Simons, & van Beukelen, 2014; Woerkom & Croon, 2008). Learning from mistakes is known as fertile ground to learn and to improve upon.

Hence, being open about mistakes increases the willingness to explore the meaning of the mistake and what can be learned. Additionally, conducting reflection frequently contributes to developing the skill to reflect. Without practising reflection, the ability to reflect can hardly be developed. Hence, *reflection experience* contributes to the ability to reflect.

***Motivation*** concerns both intrinsic and extrinsic motivation of the participants to reflect. *Intrinsic motivation* concerns the willingness and inclination of participants to reflect individually or collectively to share experiences and create meaning (Knipfer et al., 2013). Closely related to intrinsic motivation is *learning attitude*, it concerns not only to engage in reflection but also the willingness to scrutinize the experience to learn from the experience (Nolan & Sim, 2011). Both the intrinsic motivation and learning attitude are influenced by the extent to which discrepancies are experienced in the mental models of the one reflecting (Høyrup & Elkjær, 2006). It triggers the reflection by creating a certain curiosity to explore and understand the experience. *Extrinsic motivation* concerns an external stimulus or conditions to engage in reflection. External encouragement to engage in reflection and actively participate is seen as a stimulus for reflection (Fleck & Fitzpatrick, 2010). Related to the motivation is *trust*; without trust in collaborative reflection, participants will be reluctant to openly share their experiences and mistakes in fear of retaliation (Groen, 2015; Raelin, 2002). Høyrup and Elkjær (2006) note that critical reflection in an organisation is not easy because management may not value the outcome and employees might be afraid to reveal shortcomings of the organisation or their superiors. Thus, trust is essential in collective reflection to be able to question the values and assumptions of the organisation.

The above-discussed conditions provide a brief overview of aspects influencing the degree to which reflection occurs. This list is not exhaustive, however, does create awareness that reflection is affected by many complex factors that should be taken into account when studying reflection processes. In addition, causal relations exist between some of the conditions, for example, the challenge in work might result in greater motivation to reflect because participants want to overcome the challenges. Consequently, causal complexity of the conditions of reflection makes it difficult to analyse in-depth which specific conditions result in a certain extent of reflection.

## 2.6 Reflection as integrative power for organisational learning

Thus far, this chapter has discussed organisational learning and reflection separately, this section will discuss the relationship between reflection and organisational learning. Reflection is seen as a driving force of bottom-up organisational learning since it has the potential to lead to a better understanding of one's work and can guide future behaviour. In other words, reflection is an important catalyst for transforming daily work experience into individual, team and organisational learning (Järvinen & Poikela, 2001; Moon, 1999).

As discussed before organisational learning is considered as a multi-level process, accordingly, two perspectives on knowledge flow have been distinguished in literature, namely top-down organisational learning and bottom-up organisational learning. On the one hand, top management might drive organisational learning by institutionalizing knowledge to lower levels of the organisation, this is regarded as top-down organisational learning. For example, when there is a change in external demands, management can change the business process which requires respective learning from lower levels. On the other hand, organisational knowledge is often a result of individual experience, this knowledge flows to others in the organisation establishing shared understanding on the group level, ultimately this knowledge becomes institutionalized across the organisation. This flow of knowledge is considered bottom-up organisational learning. An example is an innovation process, where the individual comes with an idea which is enriched by others and establishes common ground at the group level, once management values the idea it will manifest on the organisational level. In practice, both processes of bottom-up and top-down are intertwined; however, reflection mainly contributes to bottom-up organisational learning. The remainder of this section elaborates on how reflection complements bottom-up organisational learning.

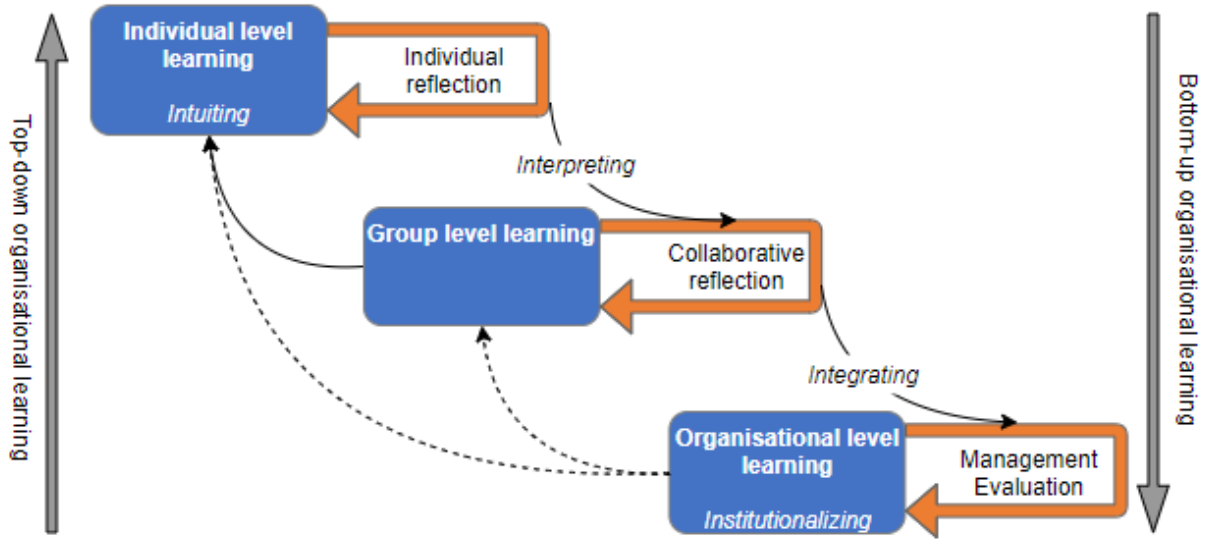


**Figure 4: Relation between organisational learning and reflection**

Figure 4 visualizes organisational learning according to the notion of Crossan et al. (1999) and the supportive function of reflection (Hilden & Tikkamäki, 2013; Knipfer et al., 2013).
Learning within the organisation is a multi-level social process consisting of the individual level, group level and organisational level (depicted in orange). On the individual level, reflection constitutes the process of intuiting and interpreting. Intuiting is the generation of new insight and knowledge, an experience can only lead to learning if one reflects upon it to understand what happens (Hilden & Tikkamäki, 2013). Thus, individual reflection upon experience leads to new individual insights and knowledge.
Interpreting is sharing experiences and knowledge with others in joint discussion to enhance individual understanding (Crossan et al., 1999). Individual reflection is a mean to make tacit knowledge explicit and thereby enables to share knowledge with others by articulation, and accordingly enables interpreting (Knipfer et al., 2013). Nonaka and Takeuchi (1995) emphasize that reflection is key to externalize tacit knowledge to others and make it explicit.
Subsequently, the outcome of individual reflection is by the process of interpreting input for collaborative reflection, where the group learns. Collaborative reflection facilitates integrating through dialogue and building mutual understanding amongst individuals (Järvinen & Poikela, 2001; Knipfer et al., 2013). As a result, the outcome of group learning shapes the individual by enhancing their personal understanding. Moreover, the collaborative reflection establishes integration by accommodation, that is, the re-evaluation of one's experiences and thoughts against those of others (Cress & Kimmerle, 2008).
When the outcomes of the reflection find enough mutual ground amongst influential members of the organisation, the knowledge likely becomes institutionalized. Before formally developing new or changing the organisational structures (e.g. systems, routines and procedures) it undergoes a process of consideration (Crossan et al., 1999). Hence, there is some form of management evaluation to evaluate whether the insights generated are beneficial for other entities of the organisation. After this consideration, the assimilated knowledge from the reflection can become institutionalized, which feeds back to both the individuals and the groups. Nevertheless, it should be noted that institutionalization occurs less frequent compared to the underlying processes prior to institutionalization (Knipfer et al., 2013).

Within project-based organisations, primarily achieving integration of knowledge across projects is complex. Yet, it follows from figure 4 that collaborative reflection on the group level mainly contributes to the integration of knowledge to achieve organisational learning. Accordingly, this research conceptualizes reflection as an integrative power that stimulates organisational learning. To integrate knowledge in PBOs participants must during reflection incorporate experiences from other projects and the organisation. Moreover, the outcomes of reflection can contain lessons learned and best practices for the organisation, which can be further developed by adding more perspectives from others in the organisation (Knipfer et al., 2013). Hence, drawing lessons (either positive or negative) for the organisation contribute to the integration and continuous development of knowledge within the organisation.

## 2.7 Conceptual framework

The previous sections in this chapter establish the reasoning of the conceptual framework for the research. The conceptual framework is divided into two models. The first model conceptualizes the extent of reflection by two dimensions: stages of collaborative reflection and reflection intensity. Moreover, the model conceptualizes the relation between the extent of reflection and the conditions of reflection influencing the extent. The second model conceptualizes reflection as an integrative power to promote organisational learning.

The first model depicted in figure 5, conceptualizes the extent of collaborative reflection and the conditions influencing the extent of reflection. In which the extent of collaborative reflection consists of the reflection stages (i.e. reflection process) and the reflection intensity (i.e. 'depth' of consideration). Reflection is a process consisting of multiple stages and the content of the process can be considered at different 'depths' (i.e. intensities). Hence, the research takes a multidimensional approach for the conceptualization of the extent of reflection. The extent increases when more reflection stages are obtained and when the content of the reflection is considered at a higher intensity.

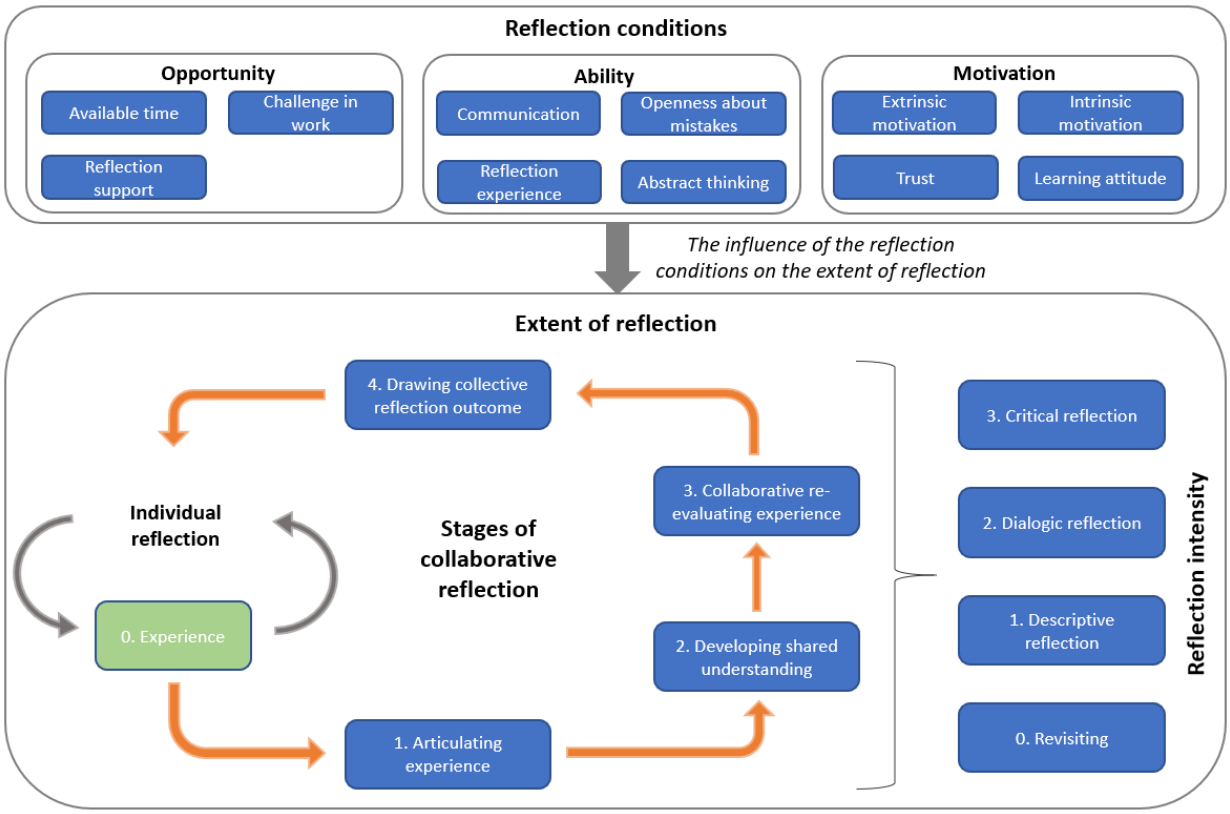


**Figure 5: Conceptual framework extent of reflection and reflection conditions**

### Reflection stages

The stages conceptualize the reflection process. The stages are articulating experience, developing shared understanding, collaborative re-evaluating experience and drawing collective reflection outcome. The reflection process is also noted as a reflection cycle in which one or multiple reflection stages are considered. A reflection cycle is the reflection process which takes place on a certain experience which has a beginning and an end. Reflection cycles consist of at least one performed reflection stage and ideally consider all the stages to complete the reflection cycle. Each reflection stage consists of multiple reflection activities which are previously elaborated in section 2.4.1. The outcome of the reflection stages feedback to the individual's reflection process, participating in the collaborative reflection. Hence, individual reflection is intertwined with collaborative reflection which occurs simultaneously. When more reflection stages are considered, the greater the extent of reflection.

**Reflection intensity**
Reflection intensities conceptualize the 'depth' of the reflection. The content of each reflection cycle (i.e. reflection process) can be considered at a certain intensity. The four distinguished intensities, from a low to high intensity are (0) revisiting, (1) descriptive reflection, (2) dialogic reflection and (3) critical reflection. When the reflection intensity increases, the greater the extent of reflection.

**Reflection conditions**
The conditions of reflection can influence the extent of reflection. The conditions are categorized in the opportunity to reflect, the ability to reflect and the motivation to reflect. It is conceptualized that each condition can influence the extent of reflection.

The second model, depicted in figure 6, conceptualizes the relation between collaborative reflection and the effect on project level learning and organisational level learning. More specifically, the model conceptualizes the integrative power of reflection which contributes to organisational learning. Organisational learning consists of multiple levels, learning at the individual, project and organisational level. The majority of the problems with learning in project-based organisations concern the integration of knowledge from the project level to the organisational level, therefore are these levels the focus for organisational learning, within this research. Project level learning regards learning of project members which participate in the collaborative reflection, and thus concerns learning within the project. Organisational level learning regards learning beyond the project on which the reflection takes place, and thus concerns learning across projects and other parts of the organisation.
It is conceptualized that collaborative reflection stimulates two activities which lead to the integration of knowledge. Both activities are stimulated by the reflection and contribute to learning on the project level and organisational level. The first activity is linking other project experiences and organisational knowledge during the reflection to make sense of the experiences on which is reflected. Linking other project experiences and organisational knowledge to make sense of the experience contributes to developing mutual knowledge within the organisation and across projects. The second activity is drawing lessons learned from the reflection for the organisation level (e.g. other projects) or the project level on which the reflection is conducted. Drawing lessons learned regards giving an explicit expression which aims to result in a change in cognition, behaviour or require action on the project level or organisational level. Lessons learned for the project mostly remain on the project, and consequently are of less value to stimulate organisational learning.
Moreover, it is hypothesized that as the extent of collaborative reflection increases, it results in greater integrative power of reflection. Thus, as the extent of the collaborative reflection increases, it contributes more to organisational learning.

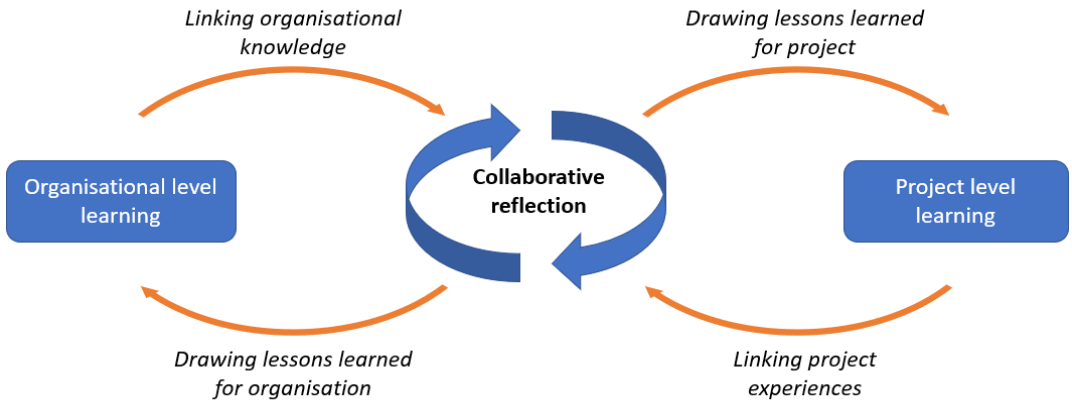


**Figure 6: The integrative power of reflection**

The models focus on collaborative reflection for two reasons. First, it is the collaborative reflection that drives the activities of the integrative power of reflection, which are essential for organisational learning within PBOs. Second, the gate reviews are conducted in a collaborative setting and thus facilitate collaborative reflection. For the remainder of the report collaborative reflection is also just noted as reflection.

# 3 METHODOLOGY

This chapter presents the methodology that is used to conduct the research and to achieve the research objective.

## 3.1 Research strategy

As stated before, the research is characterized as descriptive and exploratory and employs both qualitative and quantitative research. The research aims to provide insight into how reflection is utilized in the gate reviews to answer the research questions. Correspondingly, the chosen research strategy is a multi-case study. This allows gaining profound insight into the current practices how and to which extent reflection occurs in the gate reviews (Yin, 2003). Hence, the research aims to provide a deep insight into the contextualized situation rather than taking a broad view. Depth is achieved by using intensive and various methods of data collection within the case studies (Yin, 2003). The unit of analysis of the multiple case study are the gate reviews conducted for different projects of Van Hattum en Blankevoort and VolkerRail. Furthermore, case study research is perceived as a suitable method for both exploratory and descriptive research and qualitative and quantitative research (Verschuren, Doorewaard, & Mellion, 2010). This is important because different elements of the conceptual framework are studied either explorative or descriptive and qualitative or quantitative.

A descriptive research approach is employed to determine to which extent the stages of reflection are executed and at what intensity the reflection takes place. Moreover, both a quantitative and qualitative approach is taken in determining which stages occur during the reflection and at which intensity, which are subsequently explained.

An explorative research approach is employed to discover the conditions influencing the extent of reflection and the integrative power of reflection to determine its potency for organisational learning because there is little known about these topics. Besides, an explorative research approach is taken for proposing suggestions on how the gate reviews can be arranged to promote reflection.

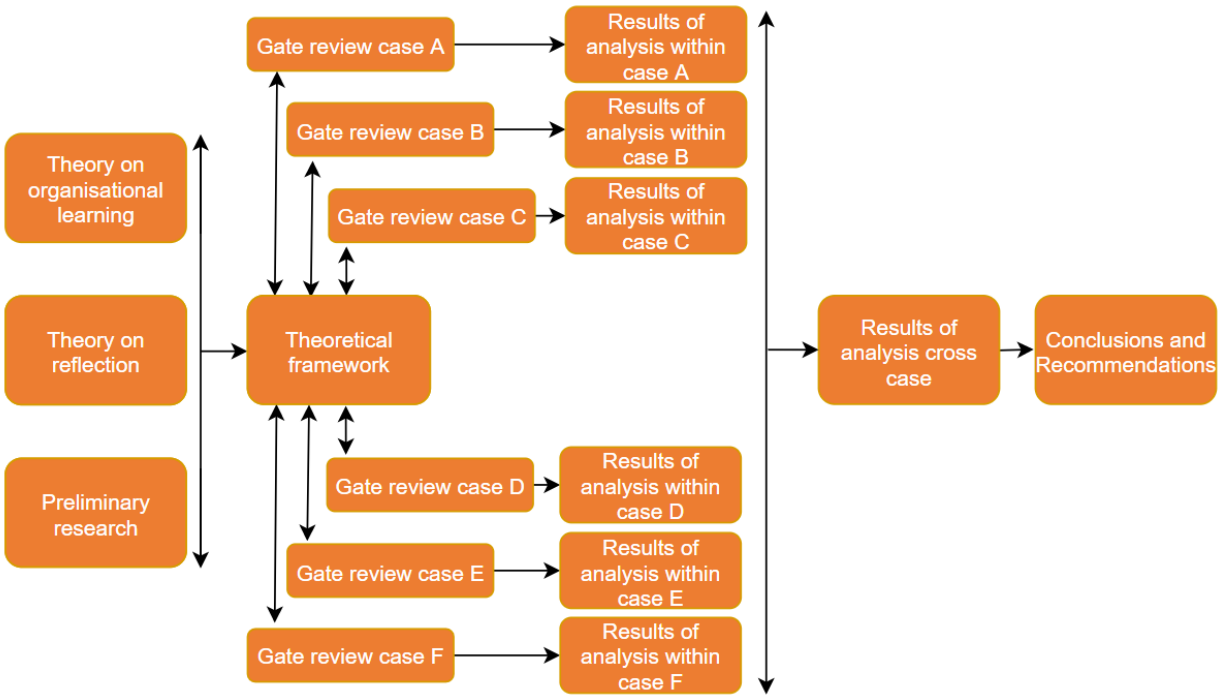


**Figure 7: research framework**

The research framework of this study is shown in figure 7, this provides a general overview of the steps which are taken to achieve the research objective. The style of the framework is based on the notion of Verschuren et al. (2010) and shows the structure of the research. First, a literature review was conducted on organisational learning and reflection. Additionally, preliminary research was conducted to understand

the mechanism of the gate review and how these were executed in practice. Second, based on the literature review and preliminary research the conceptual framework was established. Third, six case studies were performed and evaluated against the conceptual framework. Fourth, for each case, a within-case analysis was conducted. Fifth, the cross-case analysis was performed in which patterns were detected. Finally, both analyses severed as input for drawing the conclusions and providing recommendations on how the gate review can be arranged to enhance reflection in order to exploit the potential for organisational learning.

## 3.2 Case study context: the gate review procedure

This section has been removed for business confidential reasons

## 3.3 Case selection

Since the research does not only aim to describe how or to what extent the elements of the conceptual framework are present, but also to explore the relation between the elements, the number of cases should be taken into consideration. Eisenhardt (1989) suggest that when studying relations between qualitative variables 5-10 cases are appropriate. Therefore, also taken the feasibility of the research into account, 6 cases were selected for the multiple case study.

The cases were mainly selected based on their availably. During the research few cases were available as gate reviews are not often conducted during the time frame for data collection. Hence, not only cases were selected at Van Hattum en Blankevoort (VHB), but also at VolkerRail (VR) a sister company specialized in the rail industry and who also adopted the gate review procedure. Additionally, cases were selected based on the following criteria:

- The gate review must be for a project in the design or execution phase (gate 4-7). The gate reviews in these phases are seen as most critical for learning and sharing knowledge because the links to other projects and the organisation are the weakest within these phases, making it complex to share knowledge (Mainga, 2017).
- The gate review must be for a project with a turnover between 1-50 million as this is the core business of VHB. Moreover, to prevent very large cases with tremendous amounts of data, reducing the feasibility of the research.

An additional precondition for selecting cases was that the participants were willing to cooperate with the research.

An overview of the case characteristics is presented in table 1. All the cases concerned projects within the design and execution phase. Noteworthy, case F is a thermometersessie which slightly differs from the gate reviews. The thermometersessies are part of VolkerRail's implementation of the gate review procedure in which they combine gate reviews and thermometersessies. The dialogue, set up and discussed topics are similar to gate reviews, however without a strict gate mechanism with a final verdict. All gate reviews lasted between one hour and two and a half hours. The differences in time potentially impact the reflection process and outcomes and is therefore relevant to take into consideration. The number of project members participating in the cases varied between 2 and 5, this might influence the dynamic of the dialogue and the reflection. Hence, the number of project members can affect certain conditions. The number of facilitators present during the gate review did not vary across cases with two facilitators. The number of facilitators might have influenced how the reflection was supported and guided during the gate reviews. Across the cases, the gate review outcome varied between red, orange and green, and for the last two cases, the facilitators did not provide a gate review outcome. The gate results provide more insight into how the project performs and consequently might indicate how project members experience the project complexity. The experienced project complexity might influence the reflection and thus the gate result should be taken into consideration.
Noteworthy, some of the project members and facilitators participated in multiple cases. The facilitators for case A, B and C were the same. For case D, one facilitator was new, the other also conducted case A, B and C. The facilitators of case E and F were also the same. One project member participated in case B, C and D and two project members participated in case E and F. All other project members varied across the cases.

Table 1: Case characteristics

| Element \ Casus | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| **Gate** | 4 | 4,6&7 | 6&7 | 4&6 | 4 | Thermometersessie |
| **Company** | VHB | VHB | VHB | VHB | VR | VR |
| **Gate review Duration** | 2:30 | 2:00 | 1:35 | 2:30 | 1:00 | 1:35 |
| **Number of project members** | 2 | 3 | 2 | 2 | 5 | 5 |
| **Number of facilitators** | 2 | 2 | 2 | 2 | 2 | 2 |
| **Gate result** | Red | Green | Green | Orange | - | - |

## 3.4 Data collection

Multiple sources were used to collect data, which increases the reliability of the research by triangulation of sources. The data sources used were document analysis, observations of gate reviews, interviews with participants and facilitators of the gate reviews and an expert panel session with facilitators. Each of the data sources was employed for different purposes of the research as elaborated below.

**Document analysis**

The document analysis was used to get an understanding of the case context and the output of the gate review. The case context concerns the project in which the gate review procedure is executed and the context of the gate review itself. Moreover, studying the project context provided the researcher with a general overview of what is at play in the project which helped during observations of the gate reviews. Collecting documented data about the gate review was used to establish a profound case description. Additionally, the output of the gate reviews is documented in the form of minutes in which the participants write down the most important findings of the gate review. These regard points of attention for the project and lessons learned. These documents were in addition to the observations used for researching the activity of drawing lessons learned of the integrative power of reflection. Table 2 shows an overview of which documents were used for the research.

Table 2: Documents for document analysis

| *Document type* | *Content* | *Research purpose* |
|---|---|---|
| General project documentation: project management plan, contract, planning | A general overview of the project | Case description and understanding the project context |
| Gate review project plan (if available) | Describes the plan for conducting gate reviews. (e.g. content in gate reviews, participants and planning) | Case description and understanding the case context |
| Gate review minutes | Important findings of the gate review, regarding points of attention for the project and lessons learned and best practices for the organisation. | Indication of lessons learned |

**Observations**

Observations were used as a second data source. The observations served to gather data about the reflection stages, reflection intensity, reflection conditions and integrative power of reflection of each case. The products of the observations were the researchers' field notes and an audio recording of the gate review. The observations took place in an uncontrolled environment (i.e. natural setting) and concern nonparticipant observation. Field notes were taken based on a format, which follows the topics of the conceptual framework. The format did not aim to prescribe very specific activities or phenomena and count the number that occurs during the observations, rather the format provided structure and focus for the

researchers which points were important to observe. The field notes were taken in addition to the audio recording to takes notes on behaviours and interactions amongst participants which could not be derived from the audio file. Noteworthy, case E and F were observed by an online video conference as these gate reviews were held online via MS Teams due to the Coronavirus restrictions.
Besides, to increase the reliability of the research, the observations of case B, C and E were done with two researchers (Yin, 2003).

**Interviews**
Although the observations provided some data about which conditions are present in the gate reviews, not all the conditions can be identified by this collection method. Therefore, semi-structured interviews were held with the participants of the gate reviews to collect data about the conditions of reflection present in the cases. During these interviews, questions were asked related to the expected conditions from the conceptual framework. Additionally, the semi-structured interview allowed to ask follow-up questions in order to further explore leads given by the interviewees. The interviews of case A, B, C and D were conducted in a face-to-face setting and the interviews of case E and F were online via MS teams with video due to the Coronavirus restrictions.
In total 14 interviews were conducted, lasting between 25 and 50 minutes. 12 interviews were held with project members and 2 interviews with facilitators. Some of the interviews were combined for multiple cases because some of the participants were present in multiple cases. Additionally, in the first four cases instead of an interview with the facilitators, a brief evaluation of the gate review was held at the end of the review. This was not possible in case E and F, hence for those cases interviews were conducted.
provides an overview of the number of interviewees per case. All interviews were recorded and transcribed for the analysis.
The interviews of each case were triangulated by checking statements of the interviewees on consistency. Additionally, when interviewees provided surprising insights these were validated during subsequent interviews with other participants of that case.

**Table 3: Interviewees overview**

| *Case* | *A* | *B* | *C* | *D* | *E* | *F* |
|---|---|---|---|---|---|---|
| **Project interviewees** | 1 | 3 | 2 | 2 | 5 | 4 |
| **Facilitators interviewees** | Brief evaluation | Brief evaluation | Brief evaluation | Brief evaluation | 2 | 2 |
| **Setting** | Face to face | Face to face | Face to face | Face to face | Online video call | Online video call |

**Expert panel**
The fourth method for data collection is the use of an expert panel consisting of three facilitators and one senior manager. The participants were selected based on their experience with gate reviews and learning within the organisation. The expert panel session served to obtain the participants' interpretation of the results to validate the findings and to generate ideas to promote the reflection within the gate review. The session was held online via MS teams as a video conference. First, the findings were presented by the researcher followed by mutual discussion between the participants, in which both researchers had a moderator role. Subsequently, the recommendations were presented followed by a discussion on the relevance of the recommendations and further generation of new insights. The expert panel session was recorded and summarized for analysis. Accordingly, changes in the interpretation of the data were made to the outcome of the expert panel.

## 3.5 Data analysis

For the data analysis, both a within-case analysis as well as a cross-case analysis was performed. In order to generate findings from the analysis, the project documents and gate review minutes, the observation field notes, the audio recordings of the gate reviews and the transcribed interviews were coded. For the analysis, a qualitative directed content analysis approach was applied (Hsieh & Shannon, 2005). This approach starts with theory as guidance to develop initial codes. Thereafter is the data coded based on the predefined codes, which for this research took place in two separate rounds to increase

coding stability. Therefore, to develop the initial codes, the conceptual framework was operationalized into indicators.

**Operationalization**

The operationalization of the conceptual framework was based on the literature presented in chapter 2 and describes each element with indicators. The operationalization of the conceptual framework is included in Appendix A and presents the indicators for all elements with the reference on which study the indicator is based. The stages of collaborative reflection are divided into reflection activities belonging to a stage and are the indicators to determine whether a reflection stage was conducted during the reflection. Similarly, for each of the reflection intensities indicators were set which correspond to achieve a certain intensity. The indicators of the conditions are based on the context in which the gate review takes place or the behaviour of the participants. The integrative power of reflection only concerns linking to other project experiences or organisational knowledge and drawing learning implications for the organisation or project. These activities are not further divided into indicators as they are specific enough to identify in the data.

**Coding strategy**

Accordingly, seven steps were taken for the coding of the collected data based on the operationalisation, which are elaborated below. The first four steps only concern the coding of the recording of the gate reviews, the fifth step also included the coding of interviews, field notes and documents. All coding was performed in ATLAS.TI 8.

First, to determine the extent of reflection it should be assessed on how many discussed topics reflection takes place. Therefore, were within this step all discussed topics of the recordings identified. Accordingly, a differentiation was made between the discussed topics which included reflection and those that did not. The discussed topics that did include reflection are referred to as reflection cycles and the discussed topics that did not include reflection are noted as control aspects. These are referred to as control aspects because within those topics it is only checked whether a certain aspect is taken into account or performed on the project without further questioning. Control aspects are for example, when the facilitators asked whether the schedule of the project is on track and the participants respond that it is without further clarification. Hence, control aspects mainly occur when there is no or limited discussion about the topic. The control aspects were not coded on their stages, intensity or integrative power of reflection as no reflection takes place. The reflection cycles represent the reflection process on a certain experience the participants are reflecting on, and thus has a beginning and an end. Hence, a discussed topic was coded as reflection cycle when a single reflection activity is performed. The reflection cycle often starts within introducing the topic, followed by conducting reflection activities and ends when the participants stop discussing the experience. The reflection cycles provided the boundaries for identifying which reflection stages, intensity and integrative power of reflection are achieved within the cycle. Furthermore, a reflection cycle must include discussion on a topic with at least the elaboration of an experience, and one reaction, ensuring interaction for collaborative reflection (Fleck & Fitzpatrick, 2010).

Second, the performed reflection stages were determined within each reflection cycle by coding the reflection activities occurring in the cycle. Determining which activities occurred is based on the operationalization of the stages. Accordingly, to achieve a reflection stage the participants must at least conduct one reflection activity corresponding to that stage.

Third, the reflection intensity at which the reflection content is considered was determined for each reflection cycle based on the indicators of the operationalization. When multiple indicators of different intensities were coded to a single reflection cycle, the intensity was determined by the most indicators corresponding to that intensity. For example, when two indicators of descriptive reflection were coded and one for dialogic reflection, the intensity of that reflection cycle is descriptive reflection. When equal indicators were coded, the highest intensity was leading and thus achieved within a reflection cycle.

Fourth, the activities of the integrative power of reflection were coded for each reflection cycle. More specifically, it was coded when participants linked other project experiences or organisational knowledge during the reflection or when participants drew lessons learned for the organisation or project. Linking other project experiences was coded when the participants explicitly mention the other project to make sense of the experience on which is reflected. Similarly, linking to organisational knowledge was coded when participants involved, for example, organisational procedures or standards in the experience to make sense of the experience on which is reflected. Drawing of lessons learned were coded when participants

gave an explicit expression which aims to result in a change in cognition, behaviour or require action on the project level or organisational level.
Fifth, the conditions were coded for each gate review based on the operationalized conditions. Noteworthy, the conditions are not specific to a certain reflection cycle, rather the conditions are similar for all reflection cycles of a single case.
Sixth, all the above steps were repeated by the researcher in separate rounds to increase the coding stability.
Seventh, all the coded reflection stages, reflection intensities, and integrative power of reflection of each reflection cycle were displayed in tables. These tables are added to Appendix C. Additionally, the presence of conditions and effect on the reflection extent were descriptively elaborated. This elaboration is presented in Appendix D.

**Within case analysis**
After the coding of data and displaying the data, a within-case analysis for each case was conducted. For this within-case analysis case reports were composed, summarizing the qualitative and quantitative findings from the data. Each case report included a case description, the results of the reflection stages, reflection intensity, conditions of reflection and integrative power of reflection, which were determined by analysing the coding of data. Moreover, the analysis establishes an understanding of how the elements of the conceptual framework relate to each other within a single case.

**Cross case analysis**
After the within-case analysis, a cross-case analysis was conducted by comparing the individual case results. By analysing the differences and similarities across cases, patterns could be discovered to build empirical evidence. Each element is separately compared between the cases, and thus the achieved reflection stages and intensity, present reflection conditions and integrative power of reflection are evaluated across the cases. The cross-case analysis ultimately provides insight into both the relationship between the extent of reflection and the present reflection conditions, and the relation between the extent of reflection and the integrative power of reflection. Accordingly, the results are discussed in light of existing studies.

## 3.6 Internal research validity

The internal research validity concerns the certainty that conclusions about the extent of reflection, the conditions influencing the extent of reflection, the integrative power of reflection, and suggestions for arranging the gate reviews are justified by the collected data (Bougie et al., 2017). This research increased the internal research validity in four ways.
First, several measures were taken during the data collection to ensure reliable data. For the observations, three cases were conducted with two researchers enabling to compare the findings of the field notes. Additionally, the researchers reduced interfering with the gate review setting as much as possible to reduce the risk of reactivity of the participants (Bougie et al., 2017). Moreover, after the gate reviews, the effect of the presence of the researches was evaluated with the facilitators and for all cases, and it was concluded that there was no effect on the gate review setting. For the interviews, open questions were prepared to minimize interviewer biases. Also, it was emphasized that the interview is confidential and the results are anonymously progressed by the researcher. Hence, it was emphasized that interviewees can provide genuine information.
Second, triangulation of sources was employed to verify collected data. The findings of the audio recording were verified with those of the field notes from the observation and the interviews were compared with the observations of the gate review as well.
Third, the interpretation of data was discussed with two supervising researchers of which one also observed three gate reviews. Discussing the results with other researchers enhanced the interpretation of the data.
Fourth, the results of the research were validated with VHB by consulting an expert panel of facilitators and a senior manager. The results were presented to the expert panel and subsequently discussed. Discrepancies between their interpretations of the results and the presented results were taken into consideration and changes were made accordingly.

# 4 MULTIPLE CASE STUDY RESULTS

This chapter presents the findings of the within-case analysis and the cross-case analysis. First, the results are elaborated from a within-case analysis perspective, describing the findings for each case separately. Second, the results of the cross-case analysis are covered, comparing aspects from the reflection stages, intensity, conditions and integrative power of reflection across cases. The results of both analyses are displayed in figures 9, 10 and 11, and tables 4, 5, 6 and 8. These tables and figures are shown in section 4.7.
Appendix B provides in Dutch a more elaborate descriptive presentation of the individual results per case. Additionally, Appendix C presents the results per reflection cycle of each case, providing insight into the course of reflection and the relation between the reflection stages, reflection intensity and integrative power of reflection.

## 4.1 Case A

During the gate review of case A, 28 different topics were discussed of which 18 included reflection (i.e. reflection cycles). The majority of the reflection cycles were initiated by the facilitators asking about how certain project tasks were executed based on the assessment criteria from the gate review procedure. Hence, these discussed topics evolved from initially a control aspect into a reflection cycle as the participants performed multiple reflection activities. Nevertheless, some of the reflection cycles started by a facilitator providing an example from another project which triggered the project team to reflect upon the topic for the present project. In these instances, the sharing of knowledge from other projects helped to reflect during the gate review.

**Reflection stages**
The participants paid relatively much attention to all the reflection stages during the reflection cycles, indicating a relatively high extent of reflection from a process perspective. Nevertheless, the reflection stages were not considered to the same extent, mainly the reflection stages ‘developing shared understanding’ and ‘drawing collective reflection outcome’ got less attention. Considering the reflection activities, it is noteworthy that none of the reflection cycles regarded ‘good practice’. Thus, no ‘best practices’ are gained from the project which could have valuable lessons for other projects. On the contrary, a lot of bad practices, challenges and problems were shared during the gate review. This focus is likely due to the high complexity of the project which causes problems on the project. Under these circumstances, it is not surprising that the facilitators gave relatively much advice. In four instances, the advice was provided based on another project experience. For example, during reflection cycle 15 (see appendix C) one of the facilitators gave the following advice for the problems the project team experienced with immature knowledge about the changes in the contract: ‘‘In prior projects, we have invested in a lot of lunch lectures about specific topics like contractual awareness and changes in the contract’’.

**Reflection intensity**
The majority of the reflection cycles were considered at a descriptive reflection intensity. The higher reflection intensities, ‘dialogic reflection’ and ‘critical reflection’, occurred respectively in four and one reflection cycle. The third reflection cycle, which has a critical reflection intensity, shows relatively much focus on the collaborative evaluation of the experience and the drawing of a collective reflection outcome (see appendix C). Correspondingly, but to a lesser extent, the dialogic reflection intensity also shows relative much focus on both these reflection stages. Hence, during this gate review, the latter reflection stages are important to acquire a higher reflection intensity. Moreover, the reflection cycles with a ‘revisiting’ reflection intensity considered the least reflection stages.

**The integrative power of reflection**
In twelve reflection cycles, the participants explicitly drew lessons learned for the project. In two reflection cycles also lessons learned for the organisation were drawn. For example, during reflection cycle 12 the lack of the tender assumptions was discussed and one of the facilitators mentioned: ‘‘We should really learn as an organisation to determine the target quantities and monitor the targets during the design process’’. The lessons were mainly drawn during the ‘drawing collective reflection outcome’ stage and more specifically during the planning for action. Furthermore, when the facilitators provided their feedback, major findings were summarized which helped to emphasize the lessons learned for both the project and the organisation. In addition, in eight reflection cycles participants linked to other project experience and

in three instances to organisational knowledge during the reflection. Mainly the facilitators referred to other project experience or organisational knowledge. This is no surprise as they have greater seniority and get in touch with more projects due to their facilitator role. The linked experiences and knowledge either from other projects or the organisation were mainly used to consider the causes and effects of events or to propose solutions and give advice.
Considering the relation between the reflection intensity and the drawn lessons, it is noteworthy that the reflection cycles with organisational lessons (number 3 and 12) are of a high intensity, respectively, critical reflection and dialogic reflection. Lessons for the project seem to be related to both reflection cycles with descriptive and dialogic intensities. Additionally, in none of the reflection cycles with a revisiting intensity knowledge from other projects or the organisation was explicitly referred to.

**Reflection conditions**
The conditions which were primarily present during the gate review, were the reflection support, openness about mistakes, intrinsic motivation and learning attitude. The conditions which were less present were the available time for the reflection and good communication. The reflection support by the facilitators consisted of asking open and closed questions, providing feedback and giving their opinion, referring to other experiences and knowledge, giving advice and concluding. These activities seem to have contributed to achieving more reflection stages and gaining higher reflection intensities. The project team clearly expressed the mistakes made on the project, which resulted in a better evaluation, and thus more reflection stages covered. Both the intrinsic motivation and learning attitude of the project members were high, as they saw the gate review as an opportunity to share challenges and receive feedback on how to improve the project. Hence, their willingness to evaluate what went wrong and how to improve had a positive effect on the extent of reflection. On the contrary, the available time hindered the reflection in three cycles, for example during reflection cycle 10 it was mentioned by a facilitator that: ‘’we have to move to that topic considering the time left’’. This stopped the reflection and thus turned down the potential of learning from that experience. Nevertheless, the participants later mentioned that there was sufficient time available to discuss all topics. The communication between participants was clear, however, the facilitators were predominant during the dialogue. Consequently, the project team had less opportunity to provide their own insights which might have made the reflection less relevant for them.

## 4.2 Case B

During the gate review of case B, 30 different topics were discussed of which 20 included reflection. The majority of the 20 reflection cycles were initiated by the facilitators asking about how certain project tasks are executed based on the assessment criteria from the gate review procedure. Nevertheless, three reflection cycles were initiated by the project team addressing topics of issue on the project. These reflection cycles achieved a greater extent of reflection compared to the other reflection cycles and within two of these lessons learned for the organisation were drawn.

**Reflection stages**
Considering the reflection stages and activities three findings stand out. First, the participants paid relatively much attention to the ‘develop shared understanding’ stage. More specifically, to the reflection activity ‘justification of the event’ where participants justify why certain action happened. Noteworthy, the facilitators also justified the actions of the project team showing understanding and support to the project team. Second, there is approximately a linear decrease in the achieved reflection stages. That is, as the reflection stages progress, the number of reflection cycles achieving that stage decreases. Eventually, six reflection cycles achieved all stages fulfilling a complete reflection process. Third and finally, even though the participants showed in six instances convergence on the reflection outcome, participants did not plan for action or translated the outcome into behaviour. One of the project members mentioned two weeks after the gate review that no actions were yet taken based on the findings from the gate review. Hence, it is not certain if participants acted upon the reflection outcome since no actions were planned, limiting the potential to learn.

**Reflection intensity**
The majority of the reflection cycles are considered at a revisiting or descriptive reflection intensity, both with a total of seven reflection cycles. The higher reflection intensities, ‘dialogic reflection’ and ‘critical reflection’, occurred respectively in five and one reflection cycle. Noteworthy, the reflection cycles with the latter reflection intensities all achieved the reflection stage ‘drawing collective reflection outcome’, whereas

for the two lower intensities this only happened in reflection cycle 13 (see Appendix C). Thus, the last stage of reflection seems related to achieving a high reflection intensity. Moreover, the reflection cycles with the revisiting intensity considered the least reflection stages and only remained in the first two reflection stages.

**The integrative power of reflection**
Considering the integrative power of reflection, the participants drew during the gate review seven lessons learned for the project and four lessons learned for the organisation. Additionally, they linked six times other project experiences and once organisational knowledge. During the feedback, the facilitators summarized their findings separating the findings for the project and organisation. Hence, during the feedback, the lessons were emphasized making the differentiation between lessons for the project and organisation clear to all participants. In reflection cycle 2, the project team explained that the client and the project team assess each other's work and after the discussion, a facilitator concluded: ''I think this is a best practice which we might have to implement further within VHB''. This example was the only good practice determined at the project which resulted in a lesson for the organisation. Noteworthy is also reflection cycle 10, in which a project member explicitly asked how it is dealt with on other projects, followed by an explanation of the facilitators. Clearly, this reflection cycle showed learning across projects because experiences and knowledge from other project were incorporated during reflection, establishing mutual ground. The lessons were mainly given during the 'drawing collective reflection outcome' stage and sometimes during the 'collaborative re-evaluating experience' stage. Linking other experiences and knowledge mainly occurred during the exploration of causes and effect in the 'collaborative re-evaluating experience' stage. All of the lessons learned for the organisation are related to reflection cycles with a high intensity, either dialogic or critical reflection. All other reflection cycles with dialogic reflection had lessons for the project. Within reflection cycles with a revisiting intensity, no lessons were drawn nor experiences and knowledge were linked.

**Reflection conditions**
Five conditions played a particular role concerning the reflection within this case. First, the facilitators assisted the reflection by providing guidance for the dialogue, asking questions, providing their feedback, helped to evaluate the experience and linked other project experiences and knowledge. Yet, there is room for improvement because the facilitators did not pay much attention to project members own experiences they wanted to discuss, limiting their opportunity to share their own experiences. Additionally, facilitators did not always involve the project team in drawing conclusions. Consequently, actions were not taken on the project as a result of reflection. Second, the openness about mistakes is relatively low within this case. A project member held back during the discussion awaiting implicit approval of the project leader to elaborate on the problem. Additionally, the member mentioned that maybe 5% of the topics discussed were sugar-coated. This could have made the reflection less genuine and thus of less value. Third, the average learning attitude of the project team is relatively high. Two members in particular participated actively, questioned assumptions and mentioned what could be improved. Consequently, four reflection cycles directly benefited this behaviour as they achieved more reflection stages and higher intensity.

## 4.3 Case C

During the gate review of case C, 29 topics were discussed of which 19 are reflection cycles. All reflection cycles were triggered by the facilitators asking about how certain project tasks were executed based on the assessment criteria from the gate review procedure. Hence, none of the reflection topics were started by the project team sharing their experiences at first.

**Reflection stages**
Considering the reflection stages and activities three findings stand out. First, the participants focussed a lot on describing the event, however, did not often mention whether the experience concerned a good practice, bad practice or a challenge. The reflection cycles with only a description achieved fewer reflection stages and focused more on checking the performance of the project instead of learning from the experience. Second, there is approximately a linear decrease in the achieved reflection stages. That is, as the reflection stages progress from the beginning of the reflection process, the number of reflection cycles achieving that stage decreases. Eventually, four reflection cycles achieved all stages fulfilling a complete reflection process. Finally, participants had relatively minor attention for the 'drawing collective

reflection outcome' stage. More specifically, planning for action, translating the outcome into behaviour and summarising findings are not performed or at a minimum.

**Reflection intensity**
The reflection intensity is quite evenly distributed between the first three reflection intensities. The critical reflection intensity did not occur during this gate review. Hence, the reflection intensity distribution shows relatively much focus on the lower intensities. Considering the relation between the reflection stages and intensity, the reflection cycles with a dialogic reflection intensity have more focus on the 'drawing collective reflection outcome' stages compared to the other intensities. Accordingly, cycles with a revisiting intensity only remained in the first two reflection stages.

**The integrative power of reflection**
Considering the integrative power of reflection of case C, the participants drew during the gate review seven lessons for the project and two lessons for the organisation. Additionally, they linked other project experiences three times and organisational knowledge twice. During the feedback moment, the facilitators drew a lesson learned for the topic of the third reflection cycle which was not mentioned during the reflection cycle itself. Hence, the lesson is not always determined directly during the reflection cycle but can also be later mentioned by the participants. The cycles in which participants drew lessons learned also show a higher extent of reflection compared to the other reflection cycles within the case. However, not all cycles with a high reflection extent (i.e. many achieved reflection stages and high intensity) show lessons learned for either the organisation or project. Additionally, it is remarkable that reflection cycle 13 has a limited performed reflection stages yet is considered at a dialogic reflection intensity and lessons learned were drawn for the organisation. This seems odd; however, the topic regarded the use of 3D designs which was also discussed shortly before this gate review during the gate review of case B. Consequently, the participants did not need much discussion as they referred to the other gate review, in which both facilitators and one of the project members also participated.

**Reflection conditions**
Three conditions played a particular role in relation to the reflection within this case. First, the reflection support of the facilitators was inferior compared to other cases. Mainly during the beginning of the gate review, the facilitators lacked concentration for the dialogue and were less critical. The facilitators stated that they were tired due to conducting two gate reviews directly after each other, and therefore had less focus during the gate review of this case. Additionally, they were focused on checking the performance of the project instead of having a learning locus, and thus asked more questions about how things happened instead of why things happened in that way. Nonetheless, by guiding the dialogue, asking questions and helping the team to evaluate they also supported reflection. Second, one project member did not show a learning attitude, as he perceived conducting a gate review on a well-performing project (as the current case) is less relevant. Consequently, he was valuing learning as a lower priority and thus might have influenced the extent of reflection achieved. Finally, the project team mentioned that the gate review felt rushed and not all topics were discussed to a satisfactory level. Accordingly, the reflection was likely, however to a limited extent, negatively influenced by the time constrains.

## 4.4 Case D

During the gate review of case D, 42 topics were discussed of which 26 included reflection aspects. The majority of the 26 reflection cycles were initiated as a result of questions about the project performance, based on the assessment criteria from the gate review procedure. The project team started the reflection on their own experiences themselves three times. Hence, in the majority of the discussed topics evolved from a control aspect to reflection cycle, to investigate the underlying reasons of why an experience occurred.

**Reflection stages**
Overall the case scored the poorest considering the reflection stages, having relatively the least achieved stages. Considering the reflection stages and activities three findings are noteworthy. First, mainly at the beginning of the gate review, the dialogue went unstructured and experiences were not placed as a central discussion topic. As a result, the reflection cycles show limited achieved stages. Second, the achieved number of reflection stages decrease from the first reflection stage, 'articulating experience' to the final reflection stage 'drawing collective reflection outcome'. Thus, there is minor attention for the last two

reflection stages; ‘collaborative re-evaluation experience’ and ‘drawing collective reflection outcome’. Hence, there is more focus on understanding what happened instead of learning from the experiences. Eventually, four reflection cycles achieved all stages fulfilling a complete reflection process. Third, during the feedback moment, there were relatively many reflection cycles conducted, 6 of the 26 cycles in total. These appeared to be more genuine and based on participants feelings due to a discrepancy between the facilitators and the project team on the gate review outcome. Consequently, topics got discussed more exhaustive resulting in more achieved stages and a higher intensity compared to the other reflection cycles which took place during the main part of the gate review.

**Reflection intensity**
The majority of the reflection cycles are considered at a revisiting or descriptive reflection intensity, respectively 11 and 12 out of the 26 reflection cycles in total. Three reflection cycles reached a dialogic reflection intensity and none critical reflection. The reflection is, therefore, more focussed toward checking the project performance, instead of understanding the causes behind experiences which occurs with higher intensities. Considering the relation between the reflection stages and reflection intensity, reflection cycles with a revisiting intensity all remained within the first two reflection stages. When the intensity increased, also the amount of achieved reflection stages increased.

**The integrative power of reflection**
Considering the integrative power of reflection, the participants drew four lessons learned for the project and two for the organisation. Additionally, they linked six times to other project experiences but did not refer to organisational knowledge. During all the cycles with a dialogic reflection intensity, participants drew lessons learned, twice for the organisation and once for the project level. The other three lessons for the project happened within cycles with a descriptive intensity. Linking other experiences and organisational knowledge happened mainly during the ‘collaborative re-evaluating experience’ stage. Overall the integrative power of reflection for this case is relatively low.

**Reflection conditions**
Two conditions mainly affected the extent of reflection during the gate review of case D. First, the support for reflection by the facilitators was relatively poor. At the beginning of the gate review, the dialogue was unstructured because the facilitators did not divide tasks between taking minutes and guiding the dialogue. Consequently, one facilitator did both tasks making it difficult focusing on the reflection, while the other facilitator did not actively participate. Additionally, one of the facilitators was inexperienced with gate reviews and struggled with guiding the dialogue and asking critical questions spurring reflection. Moreover, the facilitators lacked attention for learning potential. For example, reflection cycle 23 started very promising with a project member elaborating that the systems of the organisation do not fit the time pressure associated with wind turbine projects. However, the facilitators did not pick up these signals and instead focused on how the project team coped with the situation. Accordingly, the lessons learned for the organisation was not exploited. Second, the facilitators paid much attention to the project documents, losing focus for the dialogue. As a result, the flow of the conversation was hindered and the communication between participants poor.

## 4.5 Case E

During the gate review of case E, 18 topics were discussed of which 14 concerns reflection cycles. The case shows a relatively high extent of reflection. The reflection cycles were initiated in two ways. The majority started due to facilitators asking questions about different aspects of the project. Additionally, the project members elaborated five times on certain experiences of the project on which reflection followed.

**Reflection stages**
Overall the case scored relatively high on the reflection stages because participants performed relatively many reflection activities, and thus achieved many reflection stages. Eventually, 50% of the reflection cycles achieved all reflection stages, completing a full reflection cycle. During the reflection, there was much attention for the stages ‘collaborative re-evaluation experience’ and ‘drawing collective reflection outcome’. Hence, participants aim to understand the experiences and learn from the experience. Within the stage ‘collaborative re-evaluation experience’ participants held a constructive dialogue by questioning each other interpretation, adding perspectives and determining the cause and effects of the experience.

Additionally, during the last reflection stage, the participant planned for action relatively much and also explicitly stated the lessons for the organisation.

**Reflection intensity**
The reflection intensity distribution of case C is considerable high as the participants have achieved the most critical and dialogic reflection compared to other cases. The reflection cycles which achieved those intensities focussed on understanding the experiences and learning from them. Additionally, all of these reflection cycles also achieved all the reflection stages and show focus on the reflection activities from the 'collaborative re-evaluation experience' and 'drawing collective reflection outcome' stage. Nevertheless, also reflection cycle 6 (see appendix C) achieved all stages but remained at the descriptive intensity due to limited exploration of alternative explanations and taking multiple perspectives.

**The integrative power of reflection**
The integrative power of reflection is considered high because during relatively many reflection cycles lessons learned were drawn for the project level and organisational level. Respectively, in 50% and 21% of all reflection cycles within case E. The lessons for the organisation were stated very explicit by the participants. For example, during reflection cycle 9 a project member mentioned: ''I think we can draw a lesson learned for other projects that…''. Additionally, participants also linked other project experiences and organisational knowledge in evaluating the experience to understand and make sense of the experience. The linking happened respectively within 21% and 14% of the reflection cycles, this occurred within all intensities. Yet, the drawn lessons by the participants are mainly related to the reflection cycles which also had a high intensity, either the dialogic or critical reflection intensity. More specifically, the lessons for the organisation were drawn within cycles with a critical reflection intensity and once within a cycle with a dialogic reflection intensity. The lessons are mainly related to reflection activities within the stage 'drawing collective reflection outcome'.

**Reflection conditions**
Two conditions mainly contributed to the high extent of reflection during the gate review of case E. First, the support for reflection differs from case A t/m D, the facilitators did not chair the gate review, making them more focused on the dialogue. Therefore, they were more critical during the reflection, asking searching questions to truly understand the experience, which let the participants reflect to a higher extent. Second, the intrinsic motivation of the project members was high because they prepared the gate review in advance, predetermining the topics on which they wanted to reflect. Consequently, the reflection becomes more relevant for them as they can directly benefit from the reflection outcomes on the project. For the same reasons, the participants also had a high learning attitude because they often mentioned lessons learned for the organisation (e.g. reflection cycle 5, 8, 9 and 11), which resulted in a higher reflection intensity due to their awareness of the organisational context. In addition, the communication between participants is considered good since there was not only a dialogue between the project team and facilitators but also between the project members self. They questioned each other's interpretations and added relevant information if needed, and thus also added new perspectives on the experience, resulting in higher intensities.

## 4.6 Case F

As elaborated in section 3.3 case F concerns a thermometersessie instead of a gate review. Yet, the differences are limited and there is no substantial effect on the dialogue and reflection between these. During the thermometersessie of case F, 35 topics were discussed, of which 25 included reflection activities. The case shows a relatively moderate extent of reflection and average integrative power of reflection. The 25 reflection cycles were initiated in two ways, both occurred equally. First, facilitators asked questions about different aspects of the project based on the assessment criteria, which led to reflection. Second, the project team prepared the thermometersessie in advance and predetermined the topics to be discussed, these were elaborated by the project members followed by discussion, which frequently included reflection.

**Reflection stages**
Overall the case scored average on the reflection stages. Eventually, 20% of the reflection cycles achieved all reflection stages, completing a full reflection cycle. This is relatively low because the stage 'developing shared understanding' is not always performed, even though the stages 'collaborative evaluation

experience' and 'drawing collective reflection outcome' were performed. Nevertheless, the developing shared understanding stage is not always performed explicitly because participants can agree on the reflection experience without articulating it. During the dialogue participants provided implicit signs (e.g. nodding) when they agreed with others, however, this was not included in the results as these are based on verbally expressed findings. In addition, the participants paid relatively much attention to reflection activities within the 'collaborative re-evaluation experience' and drawing collective reflection outcome' stage. More specifically, the consideration of alternatives, exploring causes and effects and giving advice or proposing solutions occurred relatively often.

**Reflection intensity**
The overall reflection intensity of case F is considered as moderate because the distribution between reflection intensities shows some focus on the higher intensity levels, but the majority of the reflection cycles are considered at a descriptive reflection intensity. The distribution of the reflection intensity is as follows: 4% of the cycles is considered at a critical intensity, 24% considered at a dialogic intensity, 48% at a descriptive intensity and 24% at a revisiting intensity. All reflection cycles with a high intensity also performed many reflection activities within the stages 'collaborative evaluation experience' and 'drawing collective reflection outcome'. Nonetheless, also reflection cycles with a descriptive reflection intensity show reflection activities within these stages, albeit to a lesser extent. For example, reflection cycles 3 till 7 (see appendix C) were elaborated by one project member in which also attention was given to the evaluation of the experience, however, from a single perspective without much discussion with others. Consequently, these topics were considered at a descriptive intensity but not many reflection activities were performed due to limited discussion.

**The integrative power of reflection**
The integrative power of reflection is considered moderate. The participants drew some lessons learned for both the project level and organisational level. Respectively, for 36% and 16% of all reflection cycles within case F. Participants also linked other project experiences and organisational knowledge, respectively this occurred within 20% and 4% of all reflection cycles. The lessons for the organisation were mainly drawn within reflection cycles with a critical or dialogic reflection intensity. Lessons for the project are related to cycles with a descriptive or dialogic reflection intensity. Moreover, the lessons were mainly drawn during the 'drawing collective reflection outcome' reflection stage, and more specifically these were incorporated when advice was given or when the participants planned for action.

**Reflection conditions**
Four conditions were in particular present during the thermometersessie. First, this is the only case where the time was not mentioned during the thermometersessie and also the participants stated there was enough time to discuss all topics. Nonetheless, the time did not enhance the reflection, rather the time provided opportunity to sufficiently discuss the topics. Second, the support for reflection provided by the facilitators is considered high. Both facilitators have two years of experience with gate reviews and thermometersessies. They positively influenced the reflection by asking searching questions, helping to reflect and referring to other experiences. Third, also the project members have relatively much experience with gate reviews and thermometersessies as they participate in them for approximately two years. It was expected that this increased the ability of the participants to reflect, however, the results do not show a substantial effect on the extent of reflection. Finally, the intrinsic motivation of the participants is considered high because they predetermined the topics on which reflection occurs, and thus wanted to participate in the thermometersessie.

## 4.7 Cross-case analysis

The cross-case results are elaborated according to the elements of the conceptual framework. First is the extent of reflection presented in general. Thereupon are the reflection stages and reflection intensity that make up the extent of reflection further discussed. The presence of the reflection conditions and their effect on the reflection extent is thereafter presented. Finally, the integrative power of reflection and its relationship with the extent of reflection across the cases is discussed.

### 4.7.1 Extent of reflection

Before considering the extent to which reflection stages are achieved and at which intensity the reflection is conducted, it is interesting to see the extent of reflection occurring in all discussed topics of the cases. Table 4 shows the number of conducted reflection cycles, control aspects and the percentage of reflection occurring in the discussed topics. Noteworthy, both case E and F scored relatively high (both 78%) and case D scores the lowest (61%). Case A, B, C and D have relatively similar scores between 61% and 67%. The difference between cases could be caused by the perceived relevance of the participants to reflect on certain topics. Within case E and F, limited time was scheduled for the gate reviews and consequently, the participants focussed on the most relevant topics. The most relevant topics inherently gain more attention to reflect on because the facilitators want to understand how the project team deals with them to assess if the project is in control. In case D, relatively much time was available and therefore it could be that there was more time to discuss less relevant topics, which did not lead to reflection. Hence, the results seem to indicate that the initiation of reflection is based on the valued relevance to reflect on the topic. Hence, the ratio between reflective and non-reflective topics depends on the priority to discuss topics.

**Table 4: Number of conducted reflection cycles and control aspects**

| | Case A | Case B | Case C | Case D | Case E | Case F |
|---|---|---|---|---|---|---|
| **Number of Reflection cycles** | 18 | 20 | 19 | 26 | 14 | 25 |
| **Number of control aspects** | 10 | 10 | 10 | 16 | 4 | 7 |
| **Percentage of discussed topics in which reflection occurred** | 64% | 67% | 66% | 61% | 78% | 78% |

Nevertheless, whether reflection occurs or not, provides only limited insight into the extent of reflection. Reflection can still be conducted with limited consideration of reflection stages and at a low intensity. Therefore, it is more worthwhile to consider what happens within the reflection cycles to determine the extent of reflection.

The total extent of reflection is determined by the achieved reflection stages in relation to the reflection intensity distribution. When more reflection stages are covered in combination with high reflection intensities, the higher the total reflection extent. Accordingly, comparing the cases, case A and E are classified with a high reflection extent, case B and F a moderate reflection extent, and case C and D a low reflection extent. Within case A and E, the participants conducted relatively many reflection stages and achieved a reflection intensity distribution more focussed on the higher intensities. Case F has a reflection intensity distribution approximately similar to case A, however, achieved considerably fewer reflection stages. The number of achieved stages are comparable to those of case B and thus both cases have a moderate reflection extent. Case C and D both have approximately similar consideration of reflection stages and considered the most reflection cycles at the lowest intensities. Yet, case D did score the worst on both the reflection stages and reflection intensity.

The next two subsections (4.7.2 and 4.7.3) provide the cross-case results of the reflection stages and reflection intensity that make up the total extent of reflection.

### 4.7.2 Reflection stages

Figure 8 shows the extent to which the different reflection stages are achieved in relation to the total number of reflection cycles for each case. For example, the stage ‘developing shared understanding’ is achieved in 16 out of the 20 reflection cycles for case B, correspondingly the stage ‘developing shared understanding’ is achieved in 80% of the reflection cycles. The figure helps to understand to which extent reflection has occurred within each case from a reflection process perspective. It does so by providing insight into which stages were performed in the reflection cycles.

From figure 8 follows that on average the cases scored 100% on 'articulating experience', 76% on 'developing shared understanding', 67% on 'collaborative re-evaluating experience' and 43% on 'drawing collective reflection outcome'. Two patterns arise from the cross-case analysis of the reflection stages.
First, within the majority of the cases, there is a decreasing trend in the number of achieved reflection stages from 'articulating experience' to 'drawing collective reflection outcome. To clarify, the 'articulating experience' stage is achieved the most across cases and each subsequent stage is achieved less as the stage before. This indicates that not all reflection cycles of the cases considered the full reflection process, that is, achieving all reflection stages. Hence, it seems that participants find it more obvious to elaborate on their experiences as to conclude the reflection outcome. The decrease in achieved reflection stages is likely related to the discussed topic and the willingness of the participants to understand the specific experience to learn from it. For example, experiences in which the participants did not see much reason to explore to a greater extent, remained mainly within the first two stages, whereas when participants wanted to understand the experiences, they evaluated the experience and sometimes concluded the reflection outcome. Whether the participants considered the experience to a lesser or greater extent depended on how they valued the relevance of the experience. As will be discussed in section 4.7.4, the motivation of the participants and challenge in work are considered influences on their perceived relevance.
Albeit the majority of the cases show a decreasing trend in the number of achieved reflection stages from the first stage to the last stage, case A and E are exceptions. Case A achieved both the developing shared understanding stage as well as the collaborative re-evaluating experience stage equally and case E performed the latter stage more often as the former stage. Even though no clear evidence can be provided, this might be due to the implicit nature of the 'developing shared understanding' stage. Participants did not always explicitly discuss what happened and might have understood each other without discussion. This is supported by the observations, as the participants often provided non-verbal indications (e.g. nodding) that they agreed or understood the experiences. These implicit indications could, however, not be included in the results as these were not quantified in the data.
The second noteworthy consideration is that the sequence in which the stages are completed is not fixed. In the majority of the reflection cycles, the sequence of the conceptual framework is followed, however, sometimes a step is taken back to deal with something from the previous stage. For example, when participants were re-evaluating the experience, however, it was not fully clear yet what happened, the participants returned to activities from the 'develop shared understanding' stage. Hence, performing the reflection stages seems an iterative process.

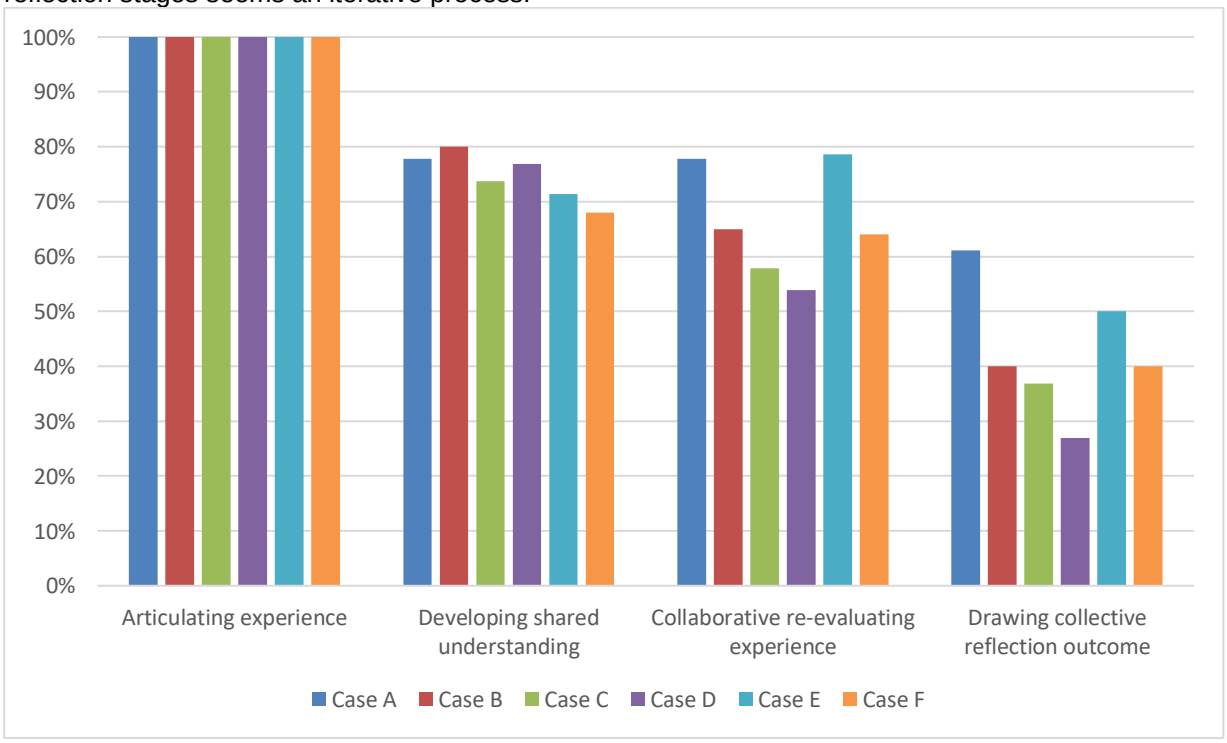


**Figure 8: Extent of performed reflection stages**

**Table 5: Extent of performed reflection activities in reflection cycles, the darker the colour the more the reflection activity occurred within that case.**

| | | Case A | Case B | Case C | Case D | Case E | Case F |
|---|---|---|---|---|---|---|---|
| **Articulating experience** | *Articulate bad practice* | 50% | 45% | 32% | 23% | 14% | 44% |
| | *Articulate challenges or problems* | 33% | 10% | 11% | 19% | 57% | 8% |
| | *Articulate good practice* | 0% | 20% | 5% | 12% | 0% | 12% |
| | *Description of experience* | 61% | 65% | 95% | 69% | 71% | 92% |
| | *Contextual factors* | 39% | 15% | 32% | 27% | 7% | 4% |
| | *Feelings or thoughts about experience* | 17% | 10% | 5% | 12% | 7% | 4% |
| **Developing shared understanding** | *Discussion on what happened* | 50% | 40% | 68% | 54% | 50% | 44% |
| | *Justification of the event* | 28% | 45% | 11% | 31% | 29% | 24% |
| | *reach agreement on experience* | 11% | 20% | 0% | 4% | 7% | 4% |
| **Collaborative re-evaluating experience** | *Challenge existing interpretations* | 11% | 5% | 5% | 8% | 14% | 8% |
| | *Adding perspectives* | 17% | 20% | 21% | 8% | 36% | 12% |
| | *Consider alternatives* | 0% | 15% | 11% | 4% | 7% | 24% |
| | *exploring causes and effects* | 33% | 35% | 47% | 35% | 50% | 44% |
| | *linking to knowledge, rules or values* | 33% | 20% | 21% | 8% | 36% | 8% |
| | *Linking to other experiences* | 39% | 25% | 16% | 23% | 21% | 20% |
| | *Posing searching questions* | 28% | 20% | 11% | 8% | 14% | 16% |
| **Drawing collective reflection outcome** | *Agreement on reflection outcome* | 33% | 30% | 21% | 4% | 14% | 8% |
| | *Giving advice or solutions* | 44% | 15% | 21% | 15% | 29% | 28% |
| | *Planning for action* | 17% | 0% | 0% | 4% | 29% | 8% |
| | *Summarizing findings and implications* | 17% | 10% | 5% | 8% | 14% | 8% |
| | *Translation of insight into behaviour* | 6% | 0% | 0% | 0% | 21% | 8% |

In order to obtain a deeper understanding of what happens within the reflection stages, the associated reflection activities provide more insight. The extent to which the reflection activities occurred during reflection for each case are shown in table 5. For example, the reflection activity ‘discussion on what happened’ occurred for case A in 9 out of the 18 reflection cycles, correspondingly the reflection activity ‘discussion on what happened’ occurred in 50% of all reflection cycles. The colour scaling in the table indicates the variation between cases in which the reflection activity occurred. The darker the colour, the more the reflection activity was performed in that case. The cross-case results of each stage and the associated reflection activities are elaborated in the paragraphs below.

**Articulating experience**

Within each reflection cycle of all the cases, the stage ‘articulate experience’ is achieved (100%). It is not surprising that this stage is achieved within all cycles because to reflect a topic (e.g. experience) must be articulated on which reflection can take place. Even though the stage is fully achieved in each case, the underlying reflection activities vary across cases. Noteworthy is that the experiences or topics discussed are based on the nature of the project. For example, the project of case A performs relatively poor and thus the majority of the experiences focus on ‘bad practices’. Similarly, the project of case E just started and thus focusses on challenges and problems encountered during the project which were not resolved at that time. The project of case B performed relatively well and as indicated by the results the gate review also focused more on good practices compared to cases in which the project performs less well. Yet, across the cases the participants consider far more bad practices and challenges (combined 59% of the

reflection cycles) compared to good practices (7% of the reflection cycles). Moreover, when good practices are considered, the subsequent number of achieved reflection stages are less compared to cycles considering bad practices or challenges. The lack of reflecting on good practices seems to be caused by the aim of the gate review and the lack of incentive for project members. The gate reviews aim to assess the performance of the project and thus focussing on bad practices is inherent to the gate reviews. Moreover, during the group interview with the expert panel, the facilitators mentioned that they explicitly focus on bad practices as considering everything that is going well on the project is time-consuming. Also, the project members have limited incentive to reflect upon good practices as it probably does not contribute to their project. Alternatively, reflecting on bad practices has the potency to improve their practices and thus the project, resulting in more motivation to reflect on bad practices.
The contextual factors of the experience were given sometimes along with the description of the event. Across the cases, project members elaborated on the contextual factors to further clarify to experience to the facilitators. Mainly within case E and F this activity is performed less compared to the other cases, this might be because the facilitators are closely involved in the project compared to the other cases. Hence, those facilitators have more inside information about the project and likely knew most of the contextual factors of the experiences.
In addition, within all cases, the participants did not often express their feelings and thoughts about the experience. This occurred the most (17%) within case A, as one of the project members was emotionally affected by the performance of the project and thus sometimes referred to his emotions.

**Developing shared understanding**
The scores on 'developing shared understanding' vary between 68% and 80% across the cases. The variance between cases is limited and no clear indications are found for the differences. In the majority of the cases, a discussion took place on what the concrete experience was and what happened. Discussion occurred mainly during a question-answer dialogue between the project team and facilitators, whereby the facilitators were often the information requesting party. Therefore, was the activity mainly aimed at informing the facilitators to get a better understanding of the experiences. There is a greater deviation between cases on the justification of the event varying between 11% and 45%. Despite the differences across the cases, both the project teams and the facilitators justified why certain actions were taken during the experience. Reaching agreement on the experience happened the least across cases between 0% and 20%. However, this activity does not always happen explicitly as participants sometimes nod as an indication they agreed. This non-verbal communication is however not included within the results.

**Collaborative re-evaluating experience**
The scores on 'collaborative re-evaluating experience' vary between 54% and 79% across the cases. Case A (78%) and E (79%) achieved the highest scores and case C (58%) and D (54%) the lowest scores. The differences between those cases seem to be caused by a difference in focus on checking what is done on the project and learning from the experience. Within case A and E the participants strived more to understand the experience and thus to conduct activities like exploring causes and effects. Whereas, within case C and D the participants moved on quicker when the experiences were elaborated, without recognizing learning potential. This contrast mainly occurred due to dissimilarity in motivation and reflection support, which is further explained in section 4.7.4. Considering the reflection activities within this stage all the cases performed the exploration of causes and effects the most. This implies that in re-evaluating the experience considering what the causes and effects are, is an important activity to perform. The facilitators posed the most searching questions, which in all cases helped to further scrutinize the experiences, and thus is supporting in achieving more reflection activities within this stage. Moreover, the participants, mainly the facilitators, referred to other experiences or knowledge, rules and values. These activities were performed to make sense of the experience or emphasize the relevance by mentioning that equal situations occurred on other projects. Linking to experiences, knowledge, rules or values was done in the cases which also scored relatively high on this stage, namely, case A and E. No evidence was found why participants referred to a great or lesser extent to other experiences or knowledge. Nevertheless, it likely depends on whether the participants possess similar experiences or knowledge they can refer to. Challenging existing interpretations, adding perspectives and considering alternatives were performed the least within this stage across all cases. Noteworthy, case E and F did score high on these activities. Both cases had a better mutual dialogue between project members and more project members were involved compared to the other cases, hence this likely contributed to achieving more of those activities.
**Drawing collective reflection outcome**

The scores on 'drawing collective reflection outcome' vary between 27% and 61%, where Case A scored the highest and case D the lowest. Case A scored high as the facilitators provided much advice and solutions because the project did not perform well. Likewise, within case E, participants discussed relatively many challenges and problems, and as a result, participants provided relatively much advice and planned for action. On the contrary, case D was more focussed on checking whether activities were performed and thus giving advice and planning for action were less relevant to the participants and accordingly scored low. On average the reflection activity 'giving advice or solutions' gained the most attention within this stage. Agreement on the reflection outcome was attained often more implicit, by briefly agreeing on what others said as a potential cause for the experience. Planning for action got minor attention across cases, except in case E. Similarly, translating the reflection insight into behaviour is not performed often except within case E, where participants sometimes stated that the organisation should change behaviour. Both activities were executed more during that gate review as the participants focussed on tackling challenges and problems.

### 4.7.3 Reflection intensity

The second dimension for the reflection extent is the reflection intensity. The distribution of the reflection intensity of the cases is shown in figure 9. The figure provides insight into how many reflection cycles are considered at a certain intensity. To illustrate, the distribution of case A is as follows: 4 of the 18 reflection cycles achieved the intensity 'revisiting', 9 of the 18 reflection cycles achieved the intensity 'descriptive reflection', 4 of the 18 reflection cycles achieve the intensity 'dialogic reflection' and 1 of the 18 reflection cycles achieved the intensity 'critical reflection'. Respectively, the distribution for the intensity of case A is 22%, 50%, 22% and 6%.

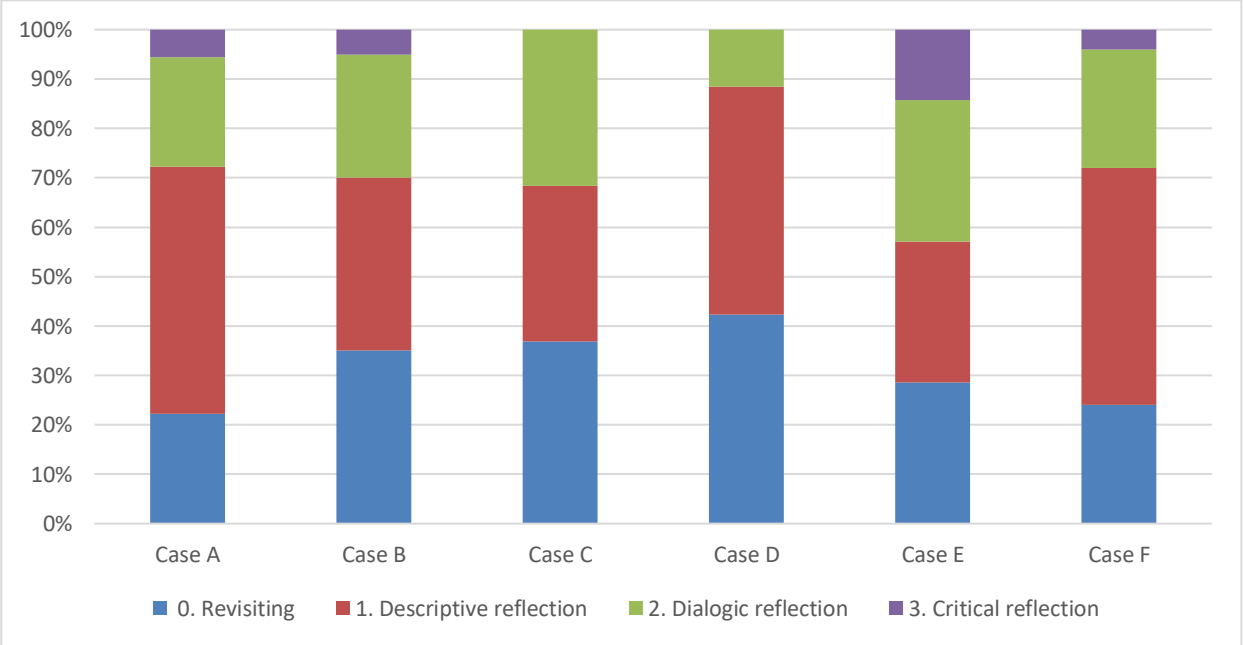


**Figure 9: Distribution of the reflection intensity**

The average reflection intensity distribution of the cases is: 31% of the reflection cycles are considered at a revisiting intensity, 40% on a descriptive reflection intensity, 24% on a dialogic reflection intensity and 5% on a critical reflection intensity. The results show that the higher the intensity the less this intensity is achieved, apart from the descriptive reflection intensity as this occurs more than the revisiting intensity.
That lower intensities occur more often as high intensities partially depend on the nature of the discussed experiences. The nature of the experience can regard different levels, it can be related to the project level or organisational level. An experience related to the project level might not be considered at the highest intensity as it is unlikely that the experience is related to values and norms of the organisation. Moreover, these experiences are more likely to be encountered during daily operations and consequently, the

participants have presumably more experiences related to the project level as to the organisational level. In contrast, experiences related to the organisational level could benefit from higher intensities. However, experience related to the organisational level likely occurs less. Therefore, reflection likely takes more often place on lower intensities as higher intensities.
The largest variation in distribution is between case D and E, where D mainly achieved low intensities (42% revisiting and 46% descriptive reflection), case E achieved the highest scores on the high intensities (29% dialogic reflection and 14% critical reflection). The difference exists because within case D participants often only explained the experience without questioning underlying reasons why it happened, while the participates of case E did. Moreover, participants of case E took multiple perspectives, questioned each other and explicitly mentioned what the wider implication of experiences could be.
Additionally, that highlights the relation between achieving multiple reflection stages and achieving high reflection intensities. The results across the cases show that reflection cycles with many achieved reflection stages, mainly the 'collaborative re-evaluating experience' and 'drawing collective reflection outcome' stage, also achieve a relatively high reflection intensity. Hence, when participants focussed more on achieving all reflection stages their consideration of the experience is more comprehensive and thus increased the intensity. Reflection activities that mainly contributed to achieving high intensities are the consideration of multiple perspectives, exploring causes and effects, and challenging existing interpretations. These activities enabled the participants to truly scrutinize the experiences to get to the heart of the experience, which is required in achieving critical reflection. Therefore, imply the results that achieving multiple reflection stages contributes to increasing the reflection intensity.

### 4.7.4 Reflection conditions

The presence of the reflection conditions and their effect on the reflection extent are shown in Table 6. An 'average' score indicates that the condition is in an average extent present during the case, the score 'high' indicates that the condition is in a high extent present in the case and a 'low' score indicates that the condition is in a low extent present in the case. If a condition is not present during the case this is indicated by 'n/a'. The effect on the reflection extent is indicated by colours, in which green is a positive effect, red a negative effect and no colour no effect. For example, the 'available time' for the gate review of case A is average and had no clear effect on the extent of reflection. The 'learning attitude' of the project team is in case A high and had a positive effect on the extent of reflection. The reasoning behind the scoring and the perceived effect on the reflection are elaborated in Appendix D. The next paragraphs discuss the conditions according to their categories.

**Table 6: Presence of conditions indicated by low, average and high, and effect on the reflection indicated by colour, positive effect is indicated by green, no effect by no colour and negative effect by red.**

| *Category* | *Condition* | *Score Case A* | *Score Case B* | *Score Case C* | *Score Case D* | *Score Case E* | *Score Case F* |
|---|---|---|---|---|---|---|---|
| ***Opportunity*** | *Available time* | Average | Average | Low | Average | Average | High |
| | *Challenge in work* | High | Average | Average | Low | Average | Average |
| | *Reflection support* | Average | Average | Low | Low | High | High |
| ***Ability*** | *Reflection experience* | Low | Low | Low | Low | High | High |
| | *Communication* | Low | Average | Average | Low | High | Average |
| | *Openness mistakes* | High | Low | Average | Average | Average | Average |
| | *Abstract thinking* | Average | Average | Average | Average | Average | Average |
| ***Motivation*** | *Extrinsic motivation* | N/a | N/a | N/a | N/a | N/a | N/a |
| | *Intrinsic motivation* | High | Average | Average | Average | High | High |
| | *Trust* | Average | Average | Average | Average | Average | Average |
| | *Learning attitude* | High | High | Low | Average | High | Average |

**Opportunity**

Considering the opportunity for reflection within the cases, primarily the reflection support of the facilitators has contributed to the extent of reflection. The available time and the challenge in work did not seem to impact the extent of reflection considerable. Hence, across all cases opportunity for reflection was created. Each condition is separately discussed below.

The *available time* to reflect within the gate review is for the majority of the cases moderate, except for case C in which the available time was limited and for case F in which there was plenty of time. In all cases, except for case F, the participants mentioned multiple times that the gate review should progress due to time constraints. Additionally, within case C, participants felt that the dialogue was rushed and some topics were insufficiently discussed. Consequently, the reflection is considerably hindered within this case, which is reflected by the low achieved extent of reflection. In addition, when time constraints were mentioned, the participants often stopped discussion and reflection. However, only occasionally within these reflection cycles, the reflection came prematurely to an end. Often the topics already seemed to be sufficiently discussed by the participants before mentioning the time constrains. The results, therefore, suggest that the available time for reflection cannot be seen as a condition but rather as a precondition. When there is limited time available reflection can hardly occur to a satisfactory level. Nevertheless, when plenty of time is available the extent of reflection does not increase. Moreover, the time utilized during the gate reviews depended on how many topics were discussed and to which extent. Increasing both resulted in more required time for the reflection.

The *challenge in work* varied between cases but in the majority of the cases, the project members perceived their challenge in work as average. Case A and D are exceptions. The project members of case A experienced much challenge in work as there were many difficulties on the project and they fulfilled new roles. Due to the challenges on the project, the reflection in case A only focuses on bad practices and challenges and problems. In contrast, case D concerned a routine project for the organisation and the project team takes part in the project as a subcontractor, which limits their responsibility on the project to some degree. As a result, the reflection focused more on best practices compared to case A. Albeit the variations in the challenge in work, none of the cases showed a direct influence on the extent of reflection due to the challenge in work. Nevertheless, the challenge in work is important in creating experiences and thus provides an opportunity to reflect. Yet, the challenge in work did indirectly influence the reflection positively as it increased or decreased the motivation of the project members to reflect, learn and improve. This was in particular shown at the project members within case A.

The *reflection support* from the facilitators is executed differently within the cases. The facilitators performed two common activities to support the reflection during the gate review. First, the facilitators asked questions about what the experiences were and sometimes posed searching questions about why the experience happened. When the facilitators asked searching questions, the participants in effect scrutinized the meaning of the experience and its underlying roots, enhancing the reflection. Second, the facilitators engaged in the reflection by re-evaluating the experience and drawing collective reflection outcomes together with the project team. During the dialogue the facilitators mainly performed the reflection activities: exploring causes and effects, referring to other experiences or knowledge, adding perspectives, giving advice or propose solutions, summarize the findings and implications, and plan for action. Hence, the facilitators played the role of an ‘enabling participant’ helping the project members to make sense of their experiences by incorporating their knowledge. As a result of their contribution to reflect on the experience, more reflection stages were achieved and higher intensities attaint.
Nevertheless, both activities are performed to different extents across the cases. Within case A, E and F the facilitators asked more critical and searching questions compared to case C and D. According to the facilitators of case C, they were tired because two gate reviews were held directly after each other, which limited their focus on the dialogue. In consequence, they asked few searching questions to stimulate the reflection. The reflection support within case D was limited because the facilitators were distracted by looking into the project documentations, losing focus for the dialogue. Besides, one of the facilitators had not guided a gate review before. The facilitators of case C and D also participated less in the reflection compared to the other cases. This resulted in less achieved reflection stages and lower reflection intensities.
Furthermore, within case A, B, C and D, the facilitators had limited attention for the opinions of the project team and did not explicitly asked their opinion and involved them in the concluding. As a result, and in

particular within case D, the project members did not agree with all conclusions of the reflection, hindering the development of mutual understanding on the reflection outcome.
In addition, the role of the facilitators differed between the first four cases and the last two cases, which likely impacted their ability to support the reflection. In case A, B, C and D the facilitators chaired the meeting, took minutes and guided the dialogue, whereas in case E and F the facilitators only participated and guided the dialogue. Consequently, the facilitators of the last two cases could focus more on the dialogue and therefore were able to ask more critical and searching questions. Additionally, the facilitators of the latter cases had more experience than the facilitators of the first four cases, which might have increased their ability to support the reflection as well. Even though the facilitators of the first four cases had to perform multiple tasks during the gate review, they ensured one facilitator could focus on guiding the dialogue by dividing the tasks. This seems to be an important aspect as this went wrong at the beginning of within case D, resulting in a lower extent of reflection at the beginning of the gate review.
Furthermore, the facilitators of case A, B, C and D provided the project team with feedback at the end of the gate review, summarizing the major findings and implications. This did not increase the extent of reflection, however, helped the project teams to get an overview of points of attention and get a feeling of how the project performs from the organisational perspective. Multiple project members mentioned that they found the feedback from the facilitators on how the project performs important to improve on the current and future projects.
Thus, the overall reflection support seems one of the major positive contributors to the extent of reflection achieved in the gate reviews. Even though the support for reflection of a case is moderate (e.g. case A and B), the effect on the reflection can still be positive. Therefore, is the support of reflection about the extent to which particular supporting activities are executed by the facilitators. Primarily asking critical and searching questions is one of the main activities that result in attaining more reflection stages and higher reflection intensities. Furthermore, the active participation by the facilitators in the reflection helped to increase the extent of reflection by stimulating the discussion and performing reflection activities themselves. On the contrary, a limited focus for the dialogue or limited involvement of the project members opinions seems to hamper reflection.

**Ability**
The ability to reflect had to some extent effect on the reflection. Mainly communication and openness about mistakes influenced the reflection. Nevertheless, the ability to reflect seems less related to the extent of reflection compared to the other categories. Next, each condition regarding the ability is discussed below.

The *reflection experience*, measured through the gate review experience of the project members, varied mainly between the first four cases and the last two cases. The project members who participated in case A, B, C and D had none to three gate reviews experienced. The project members of case E and F participated over the last two years in thermometersessies and gate reviews, having approximately experienced more than 10 of them. The participants of the latter cases were slightly more critical compared to those of the first cases. However, it is not clear whether this is due to their difference in experiences. Likewise, it is unclear if the experience of the participants contributed to achieving different extents of reflection, as case A (with limited experience) achieved a relatively high extent of reflection.

The *communication* between the participants within all cases was clear and there were only a few misinterpretations. Nevertheless, there are differences in how the communication took place, and how it accordingly influenced the extent of reflection. Within case A the facilitators were predominant during the dialogue leaving limited room for the project members to reflect and express their opinions. Within case B, C and F the project members had limited mutual discussion and the discussion was mainly between the facilitators and the project team. During case C communications were hampered as the facilitators were distracted, resulting in poor dialogue flow with multiple pauses. In contrast, even though held online via MS teams, the project members and facilitators of case E held mutual discussions, challenged each other and added multiple perspectives, resulting in a higher extent of reflection. Hence, the results imply that actively engaging in the dialogue and mutual dialogue between all participants positively contributes to reflection.

The *openness about mistakes* differs mainly between case A and B. During case A the project members had nothing to hide and explicitly expressed their mistakes. Contrary, during the gate review of case B a project member was hesitant with sharing information, awaiting approval from another project member to tell about the experience. Additionally, the member mentioned that occasionally the experiences told were a bit sugar-coated. The project members of the other cases did not particularly express their mistakes however also did not hide them. The openness within case A presumably did increase the extent of reflection as the project members participated more actively in the reflection. Nevertheless, the limited openness about mistakes in case B did not decrease the extent of reflection, rather it made the reflection less genuine, and thus of less value

Across the cases, the *abstract thinking* ability of the participants did not vary considerably. On average the participants of the cases had similar work and educational levels. Moreover, during the gate reviews, it did not seem that some participants were more capable than others to evaluate the experiences to create meaning. Hence, there is no clear effect from the abstract thinking ability on the extent of reflection.

**Motivation**

Regarding the participant's motivation to reflect, primarily the intrinsic motivation and learning attitude influenced the extent of reflection. The cases A, B, E and F showed considerable motivation for reflection which contributed to a higher extent of reflection. How each condition was present in the cases and which effect it has on the reflection is elaborated in the remainder of this paragraph.

The *extrinsic motivation* for the participants to engage in the gate reviews and reflect did not differ across cases. The only indirect extrinsic motivation all participants had was that the gate review is part of the procedures of the organisations. Other external stimuli were not present within the cases and thus there is no effect on the extent of reflection.

Alternatively, the *intrinsic motivation* was present in the cases and influenced the extent of reflection. The project members within case A, E and F showed a high intrinsic motivation. For example, the project members of case A particularly wanted to participate in the gate review to reflect and share the challenges and problems to improve the project. Accordingly, the extent of reflection was increased, mainly the consideration of the 'collaborative re-evaluation stage' increased. The increased motivation of the participants within case A was mostly created by the challenge they experienced on the project. In contrast to other cases, the project members of case E and F prepared the gate review and thermometersessie in advance, predetermining the topics on which they wanted to reflect. These topics primarily concerned encountered challenges on the project. Consequently, they were more motivated to discuss and reflect on these topics because it could help them to overcome the challenges. The project members of case B, C and D showed moderate intrinsic motivation as they participated actively, but not explicitly regard the gate review as an opportunity to reflect.

The *learning attitude* of the project members is high within case A, B and E. Within case A, project members were considerably open to the feedback and suggestions for improvement of the facilitators. This attitude resulted in the willingness to scrutinize the causes and effect of the experiences to improve and thus contributed positively to the extent of reflection. Within case B and E, the project members actively questioned assumptions and drew lessons learned. Within Case D and F, project members actively participated but were not particularly critical on their own actions to improve. Although participants of case C participated actively, in particular one member lacked a learning attitude as he mentioned that he valued reflecting on experiences of a project which performs well less relevant. Hence, learning was not valued as a priority and likely impacted the extent of reflection.

The *trust* between the project teams and the facilitators did not vary considerably across cases. Even though the specific relations between project members and facilitators varied and sometimes even met for the first time, everyone stated to share information openly as the facilitators are part of the organisation. The facilitators often emphasized at the beginning of the gate review that the dialogue is open and everything could be said. Moreover, the participants mentioned that as the facilitators are from the organisation, they have nothing to hide. Yet, the trust did not noticeably influence the extent of reflection as the trust across projects is more or less the same.

### 4.7.5 The integrative power of reflection

The extent to which lessons learned are drawn and the extent to which links are made with other project experiences or organisational knowledge are shown in figure 10. The figure provides more insight into the integrative power of reflection. For example, in case A the participants drew in 12 of the 18 reflection cycles a lesson for the project and in 8 of the 18 reflection cycles linked other project experiences. Respectively the extent of drawn lessons for the project is 67% and the extent of linked project experiences is 44%. The drawn lessons learned within the reflection cycles are not mutually exclusive, and thus a reflection cycle can contain a lesson for the project level and organisational level. This subsection first discusses the extent of drawing lessons learned and linking to experiences and knowledge. Thereupon, are these activities discussed in relation to the extent of reflection and more specifically in relation to the extent of reflection stages and reflection intensity.

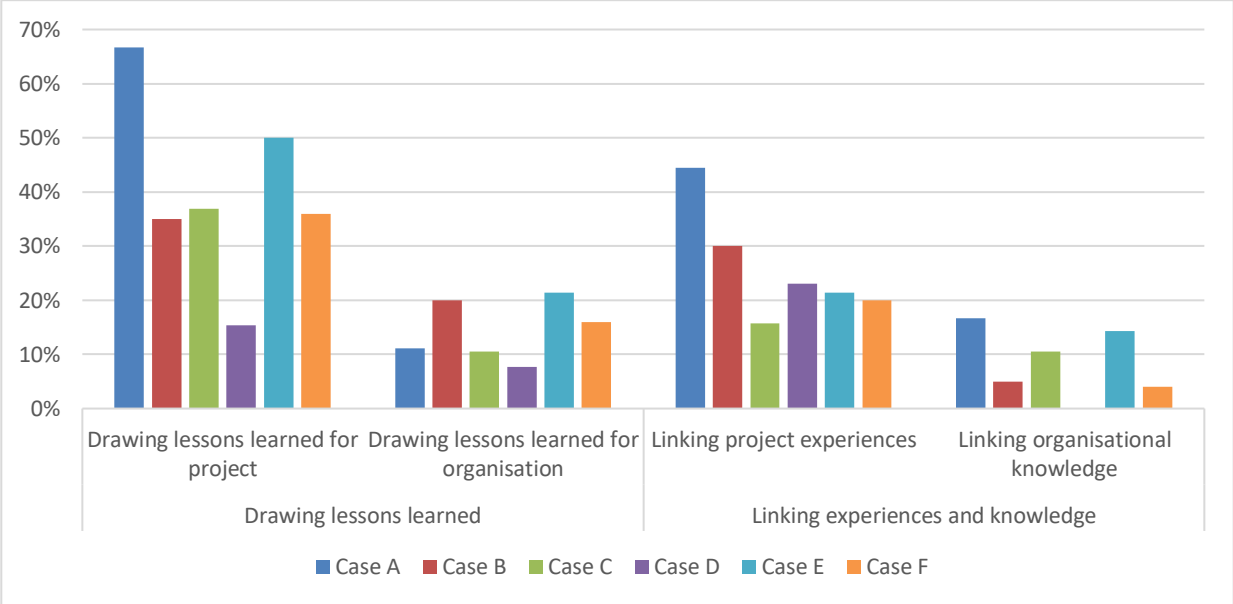


**Figure 10: Degree of learning implication and used knowledge**

**Drawing lessons learned**

On average the participants of all cases drew in 40% of the reflection cycles lessons for the project and in 14% of the cycles lessons for the organisation. In total, the participants drew 46 lessons learned for the project level and 17 lessons learned for the organisational level.

The participants of case A drew relatively the most lessons for the project per reflection cycle (67%), followed by case E (50%). Notably, both cases mainly regarded challenges and problems on the project. In those cases, the participants focused more on how the project could be improved in order to overcome the challenges and problems, and thus likely more lessons were drawn for the project compared to other cases. Case D has relatively few lessons for the project (15%) as the participants did not explicitly mention project improvements or actions. Across all the cases, the lessons for the project mainly regarded planning for action to change working practices on the project.

The relative amount of lessons drawn for the organisation per reflection cycles varies less across cases, between 8% and 21%. Case B, E and F score relatively high as the participants expressed what the organisation could learn from the experience. Within case B this regarded mainly good practices which inherently relate more to lessons for the organisation as project lessons because the project members have no reason to improve on the project as the experience (e.g. solution) already exists on that project. Alternatively, other projects (i.e. organisational level) can learn from the identified best practice. Case E and F scored high on this aspect as the structure of the gate review and thermometersessie included to draw lessons learned. Across all cases, the lessons for the organisation were often not concrete actions but rather proposed that the organisation should address certain problems. Planning for concrete actions for the organisation is complex as it likely depends on more employees across the organisation and further exploration of the problems. Hence, the lessons for the organisation are the initial impetus to address problems within the organisation.

**Linking to experiences and knowledge**

In 26% of the reflection cycles, the participants linked experiences from other projects and in 8% of the cycles linked organisational knowledge during reflection. In total, the participants linked 31 times to other project experiences and 9 times to organisational knowledge.

Linking other project experiences varied between 44% and 16% across the cases. Case A scored considerably high with 44% because the facilitators often involved experiences from other projects to give advice due to many challenges experienced on the project. Whether participant referred to other project experiences depends mainly on whether they possessed similar experiences. Mainly the facilitators who have more experiences across different projects referred to related project experiences. Moreover, the facilitators referred to experiences from other gate reviews, hence as they conduct more gate reviews, they can refer to more project experiences. Yet, the reflection must trigger the participants to share their experiences. Across all cases linking other experiences was mainly used to emphasize that similar experiences were encountered on other projects, stressing the relevance of the problem and to provide advice based on other project experiences.

The extent to which participants referred to organisational knowledge differs across the cases, mainly case A, C and E score high. Within these cases the participants mostly referred to organisational procedures, for example, how something should be done on the project according to organisational standards. Noteworthy, within case D the participants did not refer to organisational knowledge once. It could be that within this case there was insufficient relevance to link to organisational knowledge. Similar to referring to other project experiences, the participants must be knowledgeable about the organisational knowledge in order to refer to it. Mainly the facilitators have more knowledge about the organisational processes and thus mainly referred to organisational knowledge to inform the project members.

When considering individual reflection cycles in which participants referred to other project experiences to emphasize that other project encountered similar experiences, the participants frequently also drew lessons learned for the organisation. In total 10 of the 17 implications for the organisations were driven by linking to similar project experiences. This indicates that linking similar project experiences can be an important driver to draw lessons learned for the organisation. Referring to similar experiences on other projects probably increases the relevance for the participants to address the problem as multiple projects encounter the problem.

Referring to organisational knowledge does not seem to impact drawing lessons for the organisation as within none of the reflection cycles the participants referred to organisational knowledge and simultaneously drew lessons learned for the organisation. Nonetheless, when the participants referred to organisational knowledge, in 7 out of 9 times, the participants also drew lessons learned for the project. As stated before, when participants referred to organisational knowledge it often regarded the explanation of certain standards, in effect the participants plan to adapt their working procedures of the project to match organisational standards. The results therefore suggest that linking to organisational knowledge contributes to drawing lessons learned for the project, more specifically, to align project working procedures with the organisational standards.

**The integrative power of reflection in relation to the reflection extent**

The extent of reflection and the integrative power of reflection varied across the cases. When comparing both elements, the results suggest there is a positive relationship between the extent of reflection and the integrative power of reflection. Gate reviews in which the participants have achieved a relatively high extent of reflection also showed relatively stronger integrative power of reflection because more lessons learned were drawn and experiences and knowledge got linked during reflection. Hence, the results imply that when participants achieve a higher extent of reflection, the greater the integrative power of reflection is. The underlying reasons for the positive relation are further explained according to the reflection stages and the reflection intensity as they form the extent of reflection.

**The integrative power of reflection in relation to the reflection stages**

The relation between the integrative power of reflection and the extent to which reflection stages are achieved is shown in table 7. The table presents for each stage the average percentage of all cases in which activities of the integrative power of reflection occurred. For example, in 40% of the reflection cycles in which the ‘articulating experiences’ stages was achieved (116 in total), also a lesson learned was drawn for the project (46 in total). Similarly, in 39% of the reflection cycles in which the collaborative re-evaluating experience stages was achieved (79 in total), the participants also linked to another project experience

(31 in total). The table indicates which stages are relevant in achieving the activities of the integrative power of reflection. Nevertheless, the table does not show in which stage the participant performed the activities of the integrative power. Rather it presents how often a reflection stage co-occurs with an activity of the integrative power of reflection. The colour scaling in the table indicates the variation between how often the activities of the integrative power of reflection is related to a certain reflection stage. The darker the orange, the more the activity of integrative power of reflection is related to the reflection stage.
The results of the table reveal an increasing trend between drawing lessons learned for the project and the reflection stages, from 40% to 67%. As the reflection stages progress from articulating experience to drawing collective reflection outcome, the more that stage is related to drawing lessons for the project. For example, the stage drawing collective reflection outcome is relatively more related to drawing lessons learned for the project than the stage articulating experience. Likewise, the results show approximately an increasing trend between the drawn lessons learned for the organisation and the reflection stages, from 14% to 33%. Again, as the reflection stages progress from articulating experience to drawing collective reflection outcome, that stage is more related to lessons learned for the organisation. Hence, both results imply as that as more reflection stages are achieved the more likely participants draw lessons learned for both the project and the organisation.

**Table 7: Relation between reflection stages and integrative power of reflection. The percentage indicates the extent to which the reflection stage co-occurs with the activity of the integrative power of reflection.**

| | | **Integrative power of reflection** | | | |
|---|---|---|---|---|---|
| | | *Lessons learned for project level* | *Lessons learned for organisation level* | *Linking to project experience* | *Linking to organisational knowledge* |
| **Reflection stages** | *Articulating experience* | 40% | 14% | 26% | 8% |
| | *Developing shared understanding* | 45% | 12% | 24% | 6% |
| | *Collaborative re-evaluating experience* | 50% | 22% | 39% | 12% |
| | *Drawing collective reflection outcome* | 67% | 33% | 35% | 11% |

Considering the reflection stages in relation to linking to other project experiences and organisational knowledge there is no clear trend. Nevertheless, referring to either project experiences or organisational knowledge is mainly related to collaboratively re-evaluating the experience and drawing a collective reflection outcome. Moreover, during these two stages, the participants of the gate reviews drew lessons learned and referred to other experiences or organisational knowledge to make sense of the experience. In all the cases, the participants referred to other project experiences to reflect upon the experience. The majority of these linked experiences considered other projects which encountered similar experiences, which enabled the participants to use as a mirror on their own experiences. The ‘drawing collective reflection outcome’ stage is mainly important concerning drawing lessons learned because during this stage the participants often articulated the lessons in form of actions. More specifically, the participants drew lessons while giving advice, planning for action or translate the insight of the reflection into future behaviour. Even though lessons learned can be drawn without proposing follow up actions, this reflection activity seems essential to turn the implication into actual behaviour. This is illustrated by case B, as the participants did not act upon the drawn lessons learned from gate review within two weeks. It is therefore unlikely that lessons are translated into a changed behaviour (i.e. learning) when no actions are planned according to the drawn lessons learned.

**The integrative power of reflection in relation to the reflection intensity**

The relation between the reflection intensities and the integrative power of reflection is shown in table 8. The table presents the total extent of all cases to which activities of the integrative power of reflection occur within the reflection intensities. For example, in 61% of all the reflection cycles with a dialogic reflection intensity (28 in total), the participants drew lessons learned for the project (17 in total). Likewise, the participants linked in 60% of all reflection cycles which achieved critical reflection (5 in total) to other project experiences (3 in total). The colour scaling in the table indicates the variation between how often the activities of the integrative power of reflection are related to a certain reflection intensity. The darker the orange, the more the activity of integrative power of reflection was performed in the reflection intensity. The table reveals that lessons for the project level are mainly related to reflection cycles with either a descriptive or dialogic reflection intensity. The drawn lessons learned within cycles with a revisiting reflection intensity are limited to two cycles across all cases and no lessons learned for the project were drawn within a reflection cycle with a critical reflection intensity. The number of lessons learned for the organisational level increase as the reflection intensity increases and is mainly concentrated in the critical reflection intensities. That lessons learned for both the project level and organisation level are limited within the revisiting intensity is because within those reflection cycles the participants only explained what happened without further exploration to understand the experience. Hence, the participants often did not identify things to improve and consequently did not draw lessons learned.

That the lessons drawn for the organisation strongly relate to reflection cycles with critical reflection is not surprising. This is because one of the indicators for achieving critical reflection requires to consider the topic to the organisational context. Consequently, the lessons drawn at this intensity concerned the organisational level. Nevertheless, it is remarkable that the drawn lessons learned within reflection cycles with critical reflection did not concern the project level because the lesson learned could be for both the organisational level as well as the project level. Perhaps the participants only stated lessons learned for the organisation when the action goes beyond the power of the project team and require more structural change within the organisation. This could be a reason why the participant did not also draw a lesson for the project level, however, there is insufficient evidence that this was the case.

Nonetheless, the results do suggest that when the reflection intensity increases, the participants likely draw more lessons learned for either the project level or the organisational level. When the topic is considered at the critical reflection intensity, the lessons learned likely regards the organisational level and not the project.

Considering the reflection stages in relation to linking to other project experiences and organisational knowledge there is no clear trend. Other project experiences were not used during reflection cycles with a revisiting intensity, likely because the participants only explained what happened without making sense of the experience which does not require utilizing other project experiences. For critical reflection, participants did frequently (60% of the reflection cycles with critical reflection) link to other project experiences. These are related to each other because when participants considered experiences more in-depth, which is required for a critical intensity, they likely involve other prior experiences to make sense of the experience. Therefore, do the results suggest that linking to other project experiences appears to be an inherent characteristic of higher reflection intensities.

Referring to organisational knowledge seems more random and not specifically related to a reflection intensity. Nevertheless, it is noteworthy that the participants did not refer to organisational knowledge within a reflection cycle with a critical reflection intensity, yet the reasons for this are unclear.

**Table 8: Relation between reflection intensity and integrative power of reflection. The percentage indicates the extent to which an activity of the integrative power of reflection occurs within a reflection intensity.**

| | | **Integrative power of reflection** | | | |
|---|---|---|---|---|---|
| | | *Lessons learned for project level* | *Lessons learned for organisation level* | *Linking to project experience* | *Linking to organisational knowledge* |
| **Reflection intensity** | *0. Revisiting* | 5% | 0% | 0% | 5% |
| | *1. Descriptive reflection* | 54% | 2% | 38% | 6% |
| | *2. Dialogic reflection* | 61% | 39% | 32% | 14% |
| | *3. Critical reflection* | 0% | 100% | 60% | 0% |

# 5 DISCUSSION

The purpose of this research has been to determine the extent of reflection within the gate review, the influencing conditions and the potential of reflection to stimulate organisational learning based on a multiple case study. This chapter discusses the results of the multiple case study, starting with the extent of reflection in the gate reviews. Thereupon, how the conditions influence the extent of reflection. Followed by the integrative power of reflection for stimulating organisational learning. In addition, the chapter discusses the role of reflection in the gate review in relation to organisational learning in project-based organisations. Finally, the chapter reflects upon the used conceptual framework and methodology.

## 5.1 The extent of reflection

During the gate reviews reflection takes place, yet the extent to which reflection stages and reflection intensities are achieved varies. Considering the reflection stages, there is a decrease in the number of achieved reflection stages as the reflection process progresses from the 'articulating experiences' stage to the 'drawing collective reflection outcome' stage. In other words, during the gate reviews articulating the experience occurred the most and each subsequent stage occurred less within the reflection cycles. Accordingly, not all reflection cycles of the cases considered the full reflection process, ending it with drawing a collective reflection outcome. This reveals that as the reflection stages progress the participants executed fewer reflection activities within those reflection stages. Hence, it seems that participants find it more obvious to articulate their experiences as to conclude the reflection outcome. Similarly, Jung and Wise (2020) found in their research on how well dental students reflect, that students more easily describe experiences compared to evaluating the experience and drawing an outcome. Nevertheless, Boud et al. (1985) and Moon (1999) argue that to learn from experience deliberate evaluation of the experience is required to interpret its meaning. The research therefore suggests, that collaborative re-evaluating the experience and drawing a collective reflection outcome are essential to make sense of experiences and learn from it.

Considering the reflection intensity, the results show that the higher the intensity (e.g. critical reflection), the less this intensity is achieved, with the exception of the descriptive reflection as this occurs more than the revisiting intensity. Jung and Wise (2020) found similar results, the number of reflections decreased as the 'depth' of reflection increased, with only a few reflections at the greatest 'depth'. Whether the participants achieve a high reflection intensity primarily depends on the performed reflection stages. The results of the study show that reflection cycles with many achieved reflection stages, mainly the 'collaborative re-evaluating experience' and 'drawing collective reflection outcome' stage, also achieve a relatively high reflection intensity. These stages include important reflection activities which contribute to achieving high intensities. Exploring the causes and effects of experiences and involving multiple perspectives can lead to challenging assumptions which are important for a 'deep' consideration of the reflection content (Fleck & Fitzpatrick, 2010). Hence, when participants focus more on achieving all reflection stages their consideration of the experience is more comprehensive and likely increase the intensity. Nevertheless, not all experiences should be or can be considered at the highest intensity (Koole et al., 2011). For example, a rather 'simple' problem of a project perhaps cannot be considered at a critical reflection intensity as likely the organisational assumptions do not have to be challenged or require placing the problem in the wider context. Hence, it is not always possible or fruitful to consider the experiences at the highest intensity.

This research therefore suggests that it is more important for participants to focus on conducting a complete reflection process, as to try achieving a high reflection intensity. Focussing on the reflection process likely result in a higher reflection intensity which is appropriated to the nature of the experience. More specifically, focussing on challenging existing interpretations, adding perspectives and summarizing findings and implications contributes to achieving a higher intensity. These activities enable the participants to truly scrutinize the experiences to get to the heart of the experience, which is required in achieving critical reflection (Thompson & Pascal, 2012).

## 5.2 Conditions influencing the extent of reflection

The opportunity, ability and motivation to reflect were studied by the associated conditions. The results indicate that primarily the opportunity and motivation to reflect positively influenced the extent of reflection. The conditions of the categories are briefly discussed in the light of other research below.

Considering the opportunity to reflect, the *reflection support* of the facilitators has the greatest influence on the extent of reflection. The results show that the reflection support can negatively, but mainly positively, contribute to reflection. The most important activities of the facilitators in supporting the reflection are asking searching questions, guiding the dialogue, referring to other experiences and organisational knowledge, participating in the reflection by helping to evaluate the experience and drawing conclusions, and providing feedback. First, amongst others, also Guldberg and Pilkington (2007) acknowledge the importance of asking open-ended questions to encourage participants to talk about and share experiences. In particular, asking searching questions fosters to scrutinize the meaning of experiences. Second, guiding the dialogue allows to reflect more effectively within the set time-frame. The facilitators highlighted when topics were sufficiently discussed to move on to other topics. Third, the facilitators integrate their experiences and knowledge in the reflection. Consequently, reflection is enriched as participants can use this to frame and mirror their experience. Fourth, the facilitators do not only have a mentoring role but also engage in the reflection by helping to evaluate the experiences and draw conclusions. When facilitators share their expertise and fulfil the role of an 'enabling participant' they directly help the project members to enhance their work practices on which reflection takes place (Helyer, 2015). Finally, when the facilitators provided feedback to the participants, the major findings of the reflection were summarized and the lessons learned were emphasized. Vince (2002) also acknowledges the importance of feedback in reflection, he argues that feedback is essential to frame what is going right and wrong, which in result can be utilized to improve future behaviour.

Nevertheless, the empirical results also suggest two pitfalls for the facilitators. First, the facilitators showed in two cases lack of attentive listening and focus for the dialogue. This influenced the extent of reflection as it hindered the dialogue. Helyer (2015) argues that developing good listening skills is one of the most important skills facilitators can have, as they need to listen and respond appropriately. Second, the facilitators occasionally showed limited open-mindedness to the experiences project members wanted to discuss due to their focus on discussing the predefined topics for the project assessment. In those cases, the reflection was not hindered, however, the potential learning implications of those experiences were not exploited. These experiences might especially be fruitful to discuss as these could regard aspects which are not considered in the standard topics of the gate review procedure, and thus potential leads for learning remain loose ends.

The *available time* for reflection within the gate review was for the majority of the cases sufficient. Contrary to Groen (2015); Knipfer et al. (2013) who argue that time is a driver of reflection, the results of this research suggest that the available time for reflection cannot be seen as a driver but rather as a precondition. When there is no time available participants cannot reflect to a satisfactory level. Nevertheless, when plenty of time is available the extent of reflection does not increase. Yet, whether the available time was appropriate depends on the number of topics the participants wanted to discuss and to what extent. Reflecting on more experiences and to a higher extent, requires more time. Hence, there is a trade-off between available time and reflection extent.

The results imply that the *challenge in work* does not directly contribute to the extent of reflection, rather the challenge in work creates experiences and thus opportunity to reflect upon these. Therefore, does the challenge in work not contribute to the extent of reflection. Nevertheless, literature and the empirical results suggest that much challenge in work does increase the intrinsic motivation to participate in the gate review and the learning attitude to improve upon the project (Vince, 2002). In addition, Knipfer et al. (2013) state that challenge in work can result in dissonance in the cognitive system, in which a discrepancy is experienced between the expectations and the actual situation. This 'disturbance' is a cue for the reflector, and thus increases their motivation to address the disturbance by reflecting on the experience (Yanow & Tsoukas, 2009).

The results of the research do not provide evidence that *reflection experience* influences the extent of reflection. Participants who had more experience with gate review did show a slightly more critical attitude, however, it is unclear if this is due to their experience with reflection. Yet, existing literature suggests that continuously engaging in reflection develops the ability to become a reflective practitioner (Schön, 1987).

Regarding the ability to reflect, the *communication* between participants primarily contributed positively to the extent of reflection. The results imply that actively engaging in the dialogue and mutual dialogue between all participants positively contributes to reflection. It mainly promotes adding multiple perspectives for the re-evaluation of the experiences, which results in a higher extent of reflection. This is in line with existing literature, Prilla et al. (2015) emphasize that incorporating multiple views during collaborative reflection enhances making sense of the experience.
The results of the multiple case study suggest that *openness about mistakes* did not considerably impact the extent of reflection. The participants were open to elaborated on mistakes made, likely because the facilitators are from the same organisation and the participants are willing to serve the organisation to improve. Moreover, the facilitators tried to create a safe environment by stating everything could be said, which enhances openness during the reflection. This essential according to van Woerkom and Croon (2008) as errors are one of the most fertile experiences to learn from. Moreover, the research argues that when participants are not open about their mistakes, the value of the reflection and genuineness of the outcome is affected, rather than the reflection extent.
Amongst others, Moon (1999) argue that *abstract thinking* capabilities are an important skill to reflect. Nevertheless, the results of this study did not find a considerable influence of the abstract thinking ability on the extent of reflection.

Regarding the overall motivation to reflect, primarily the intrinsic motivation and learning attitude affected the extent of reflection. The results imply that the *intrinsic motivation* of participants positively influence the reflection when the gate review is prepared in advance by the project team or when the project team experiences relatively much challenge on the project. As elaborated before, the challenges encountered create a sense of 'disturbance' which forms the trigger to engage in reflection (Knipfer et al., 2013; Yanow & Tsoukas, 2009). Accordingly, during the reflection, the participants keep striving to address the disturbance, which results in a higher extent of reflection. Preparing the collaborative reflection by predefining what goes well and poor on the project seem to increase the willingness to collaboratively discuss the experiences to learn from them. Existing literature has to my understanding not reported similar practices before. However, Knipfer et al. (2013) state that a discrepancy leads to an increased state of 'self-consciousness' which ultimately triggers the reflection process. Hence, as the participants think of what goes well and not well on the project they create 'self-consciousness' that results in the motivation to reflect during the gate review.
Closely related to the intrinsic motivation is the *learning attitude*, which also contributes to a higher reflection extent when participants strive to improve on the project. For the same reasons as the intrinsic motivation, when participants experience a discrepancy between the expected and actual, it stimulates them to overcome the gap (Knipfer et al., 2013). Hence, they strive to adapt to the actual situation and thus learn to cope with the actual situation.
The results did not show *extrinsic motivation* at the participants to engage in reflection, hence within this study, the extrinsic motivation has no impact on the extent of reflection. Nevertheless, it is difficult to motivate participants externally with for example incentives as reflection is mainly driven by intrinsic processes (Yanow & Tsoukas, 2009).
The results of the case study did not show a noticeable influence of the *trust* between participants on the extent of reflection. Nonetheless, trust is considered as an important precondition for reflection (Groen, 2015; Moon, 1999). Hence, it is assumed that the sufficient trust relation between the participants allowed them to reflect within a save environment.

## 5.3 The integrative power of reflection

In order to determine the integrative power of reflection, the research considered the extent to which integrative activities are performed. It has done so by determining the drawn lessons learned for the organisation and the project on which the gate review took place, and by determining when participants linked to other project experiences or organisational knowledge. This section further explains how project level learning and organisational level learning are driven by the reflection in the gate reviews. Additionally, it discusses how reflection in the gate review enables organisational learning in a project-based context.

### 5.3.1 Project level learning

The research found that within just less than half of the reflection cycles lessons were drawn to improve the working practices on the project. A quarter of those drawn lessons followed from participants linking to organisational knowledge. When participants linked organisational knowledge, they mostly referred to organisational procedures, for example, how something should be done on the project according to organisational standards. Subsequently, the participants frequently drew a lesson on how the project can adapt their working procedures. The results therefore suggest, that linking to organisational knowledge contributes to drawing lessons for the project. More specifically, to align project working procedures with the organisational standards. In regard to Crossan, Lane and White's (1999) 4I model of organisational learning, this knowledge flow from the organisational level to the project level is known as institutionalization. Organisational knowledge in form of procedures and standards become institutionalized in the project when the project team adapts their working practices to those of the organisation.

Additionally, lessons learned for the project were drawn when participants gave advice based on other project experiences. In particular, the facilitators played an important role in giving advice based on other project experiences. This is likely because they stronger ties with multiple projects due to their facilitator role in the gate reviews on several projects, and thus they acquire more experiences across projects.

Therefore, contributes learning on the project level through reflection to the integration of knowledge across the organisation. Experiences gained during the project on which is reflected in the gate review stimulates to link to other project experiences and organisational knowledge to make sense of the experience. Sharing the experiences and knowledge across the organisation through reflection allows to build a mutual understanding within the organisation and therefore contributes to organisational learning (Høyrup, 2004; Knipfer et al., 2013). The present research accordingly also agrees with Hartmann and Dorée (2015) that learning within project-based organisations takes place within the projects.

### 5.3.2 Organisational level learning

Lessons learned were drawn for the organisation to a lesser extent compared to the lessons learned for the project, with approximately an eight of all the reflection cycles. It is not surprising that lessons learned for the organisation occur less as those for the project, as it is difficult within a project-based nature to share lessons learned to the parent organisation (Boh & organization, 2007; Williams, 2008). Yet, when lessons were drawn, participants also often linked to other project experiences, primarily to emphasize that similar experiences were encountered on other projects. As a result, the relevance of the experience (e.g. problem) for the organisation is emphasized as multiple projects of the organisation experience problems. Likely this resulted in motivation to draw lessons for the organisation, providing the initial impetus to address the problems within the organisation. However, to exploit the learning implication, Bakker et al. (2011) state that the organisation needs to have a high adsorptive capacity. Hence, the organisation must develop the ability to recognise the value of new, information externalized within the gate reviews.

The flow from linking to other project experiences to drawing lessons learned for the organisation illustrates that experiences across projects find mutual ground at the group level and subsequently motivates participants to integrate to the organisational level (Crossan et al., 1999; Knipfer et al., 2013).

### 5.3.3 Reflection as a driver for integrating knowledge

As thus far discussed in this section, reflection is the driver to integrate knowledge across the organisation. Reflection stimulates to link project experiences and organisational knowledge to make sense of the experiences to subsequently draw lessons learned for the organisation or the project. The research additionally shows that when the extent of reflection increases, the integrative power of the reflection also increases. In other words, when more reflection stages are considered and the higher the intensity, the more likely knowledge is integrated across the organisation and lessons are drawn for the project and organisation. More specifically, the stages 'collaborative re-evaluating experiences' and 'drawing collective reflection outcome' are drivers of the integrating activities. These stages require to explore the meaning of the experience, which is done by comparing the experience to prior experiences and knowledge of one's cognitive frame (Boud et al., 1985). Accordingly, links are made with prior project experiences and accumulated organisational knowledge. Drawing and articulating a collective reflection outcome enables to externalize the project knowledge and make it available to others in the organisation (Nonaka & Takeuchi, 1995). Moreover, critical reflection is related to drawing lessons for the organisation,

as in all the reflection cycles with a critical reflection intensity the participants drew lessons for the organisation. Critical reflection requires to place experiences in the wider context, in this case, the organisation (Fleck & Fitzpatrick, 2010). Thus, critical reflection is inherently related to lessons learned for the organisation.

This research therefore suggests that reflection positively contributes to organisational learning as it drives processes to integrate knowledge within the organisation. This is in line with other studies, which have also acknowledge the importance of reflection as n catalyst for organisational learning (e.g., Høyrup (2004); Keating, Robinson, and Clemson (1996); Knipfer et al. (2013); Krogstie et al. (2013)). The results of the study mainly agree with the theoretical assumptions of Knipfer et al. (2013), as they argue that interpreting and integrating primarily depend on collaborative reflection processes. This research supports their view that through collaborative reflection the participants interpret their own experiences, which enrich their cognitive frame (i.e. learn) on which they will base future behaviour. The participants shared their experiences and thoughts with other participants and thus their experiences are interpreted (Crossan et al., 1999). As a result, the ideas and thoughts of individuals become explicit to others in the organisation Høyrup (2004).

Additionally, reflection contributes to the integrating process because participants link to other project experiences and organisational knowledge to draw lessons from the experience they are reflecting on. Hence, experiences and knowledge establish mutual ground across projects within the organisation. In addition to Knipfer et al. (2013), this research also suggests that collaborative reflection contributes to the process of institutionalizing when participants refer to organisational knowledge, specifically organisational procedures and standards. The participants consequently draw lessons to align their project practices accordingly to those of the organisation. Hence, existing organisational standards and procedures are being institutionalized within the project due to the reflections in the gate review (Crossan et al., 1999).

### 5.3.4 Reflection as a driver for organisational learning in project-based organisations

The beginning of this research started with stating that organisational learning within the construction industry is complex due to the project-based nature. The gate reviews seemed a fruitful approach in dealing with these barriers. The results also show that the reflection within the gate review can contribute to learning within projects and across projects (i.e. the organisational level) because it connects projects and the organisation. Through reflection, connections are established with other projects and the organisation to enable knowledge flow from one project to another. As reflections on projects are continuously held within the organisation it allows to build upon the findings of prior reflections and continuously develop knowledge. The continuity in conducting reflections during the project also decreases the risk of knowledge loss when the project team is disbanded (Zhao et al., 2015).

Furthermore, the facilitators have an important role in the integration of knowledge as they often link to other project experiences and organisational knowledge due to their seniority and involvement in multiple projects. Moreover, as they conduct gate reviews on multiple projects, sharing the experiences across the projects is enhanced. In this regard, reflection is considered as a personalized method of sharing knowledge within organisations (Newell, 2004). The collaborative reflection builds upon social practices and interactions between the project members and the facilitators to integrate knowledge.

In addition, the embeddedness of reflection within the project process, ensures motivation of the project members to participate as they reap the benefits of the reflection to improve upon the project. Hartmann and Dorée (2015) emphasize to promote learning as part of working practices to gain attention for learning and deal with the project pressure.

The research therefore supports, the calls of Söderlund et al. (2008) and Mainga (2017) to structurally facilitate reflection within projects as a mean for organisational learning. Moreover, the research argues that organized reflection on experiences gained during the project embedded within the project process positively contributes to the organisational learning process within project-based organisations such as in the construction industry. The reflection during the gate review contributes to the processes of integration and also to some extent to institutionalization as it established connections between projects and the organisation.

## 5.4 Reflections on conceptual framework and methods

The developed conceptual framework consists of two models. The first model conceptualized the extent of (collaborative) reflection and its relationship with the conditions of reflection. The second model conceptualized the potency of reflection to stimulate organisational learning as the integrative power of reflection. The following notes are made regarding the conceptual framework.

First, the conceptualization and operationalization of the extent of reflection are capable to provide an in-depth insight into how the reflection process is established and at which intensity the experiences are considered. The conceptualization with both reflection stages and reflection intensity also provide new insight into the relationship between these dimensions. Koole et al. (2011) argue that both dimensions are incompatible for comparison and thus imply that there is no relation between the dimensions. However, the findings of this research do indicate a relation, as conducting multiple reflection stages often results in a higher reflection intensity. Moreover, in contrast to the framework of Tsingos et al. (2015), who's model assumes that each stage can be conducted at a certain intensity, this study has considered the intensity of reflection not per stage but per reflection cycle. The results show that higher intensities are inherently related to the stages of re-evaluating the experience and drawing a reflection outcome. Hence, considering the reflection intensity for the reflection cycle seems more appropriate as high intensities cannot be achieved while conducting the first two stages.

Second, some of the conditions of reflection were difficult to evaluate based on the operationalization. Primarily the presence and effect of abstract thinking, openness about mistakes and trust were difficult to determine, and thus reduces the reliability regarding those findings.

Finally, the integrative power of reflection was not conceptualized in literature before, and thus adds to existing literature a new perspective on the evaluation of how reflection contributes to organisational learning. Nevertheless, the conceptualization of the integrative power of reflection has its limitations. The model assumes that linking to other experiences or knowledge and drawing lessons learned contributes to learning on the project level and organisational level. Even though the results show that it contributes to the integration of knowledge it is not certain if learning actually occurred. However, it was not assessed within this research if employees or the organisation actually changed their behaviour according to the gate reviews.

The strategy used for conducting this research was multiple case studies, which is considered appropriate to get a deeper understanding of reflection in the gate reviews and its potency for organisational learning. Nevertheless, there are three limitations regarding the methodology which should be taken into account when interpreting the results.

First, the research is based on six cases with limited case context variance, specifically, all cases are based on the gate review procedure and there was a limited variance between facilitators. Hence, results should be generalized with care as the reflection and integrative power of reflection are context-specific.

Second, the coding was performed with one researcher which could have introduced some instability with applying coded across different cases.

Third, due to the explorative nature of the conditions of reflection, the causal complexity of the conditions got minor attention. However, as discovered it is not a single condition that leads to reflection. Rather, it is a set of conditions that interact which influence the extent of reflection. The causal oversimplification of evaluating the effect of the conditions separately, limits to get a full understanding of how the conditions interact and how a set of conditions rather than a single condition influences the reflection. Nevertheless, this research does provide the initial cue for the conditions affecting the extent of reflection.

# 6 RECOMMENDATIONS TO VAN HATTUM EN BLANKEVOORT

The rationale for conducting this research was Van Hattum en Blankevoort's ambition to structurally facilitate learning within and across projects. The results of the study enable to make several managerial implications and provide recommendations to enhance the reflection within the gate reviews and ultimately exploit the potency for organisational learning. The recommendations are categorized into suggestion regarding the structure of the gate reviews and the execution of the gate reviews. The recommendations are summarized in figure 11 and elaborated in the remainder of this chapter.

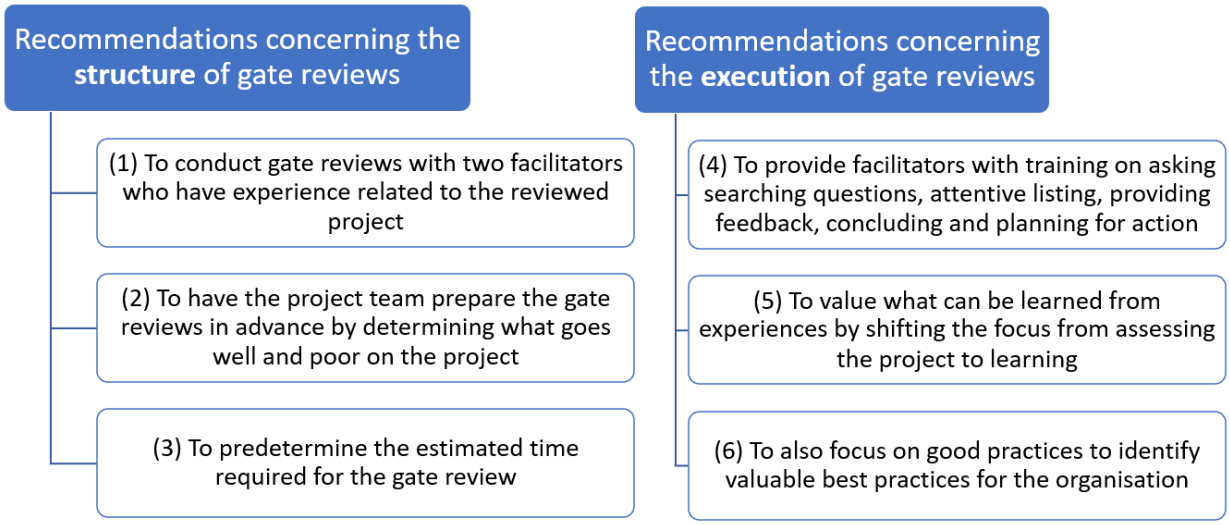


**Figure 11: Summary recommendations**

## 6.1 Recommendations concerning the structure of the gate reviews

**(1) Facilitator background and role**

As elaborated before, one of the key findings of this study is that the facilitators have an important role in stimulating the extent of reflection and to the integrative power of reflection. More specifically, the background experiences of the facilitators and their role during the gate review contribute to both elements as more experiences are incorporated in the reflection and accordingly more knowledge gets integrated. Hence, when the gate reviews are guided by facilitators with project experiences related to the project reviewed, they likely refer to other experiences and organisational knowledge more often, enhancing reflection and the potency for organisational learning. Additionally, conducting the gate reviews with two facilitators is considered appropriate, mainly when the facilitators also have to chair the gate review and take minutes. In that case, the facilitators can divide the roles and one facilitator always has attention for the dialogue to ensure attentive listening and to respond appropriately. Therefore, it is advised to conduct the gate reviews with two facilitators who have experiences related to the reviewed project and to divide the tasks of guiding the dialogue and taking minutes between the facilitators.

**(2) Preparation by the project team**

For two reasons it is recommended that the project teams prepare the gate reviews in advance. First, research findings imply that having the project members think in advance about what goes right and wrong on the project and developing topics to discuss during the gate review increased their motivation to collaborative reflect upon those experiences. Second, the facilitators argue that it offers more opportunity during the gate review to learn from the experiences and consider these to a greater extent. Consequently, a high extent of reflection can be achieved, and perhaps result in organisational learning.

**(3) Time used for reflection**

The used time for the reflection in the gate review varied across the cases, yet whether the time was appropriate depended on the number of topics the participants wanted to discuss. Moreover, the time required for reflection depends on the extent to which reflection takes place; the higher the extent of reflection, the more time it takes. Hence, there is a trade-off between available time and reflection extent. Only the participants can decide whether it is relevant to consider a certain topic at a high reflection extent.

Therefore, it is advised to predetermine the estimated required time for the reflection by briefly evaluating the project documents and contacting the project manager to get an indication of how the project progresses. Preparation of the project team therefore also contributes to establishing a better estimate of the required time. Obviously, the larger the project and the more complex, the more time is required for the reflection. Moreover, during the gate review, the participants themselves should determine the priority of discussing certain topics to a greater or lesser extent. In particular, the facilitators play an important role in determining the priority to discuss certain topics because due to their seniority they can assess if topics are relevant to the organisation.

## 6.2 Recommendations concerning the execution of the gate reviews

**(4) Increasing reflection support**

During the gate review, the facilitators can support the reflection in various manners. Five recommendations are made concerning the reflection support.

First, the results of the study indicate that asking open questions followed by searching questions stimulated the dialogue and allowed to gain a deeper understanding of the experience. Contrary, closed questions often hampered the dialogue and reflection. Therefore, can facilitators best focus on asking open-ended questions, incorporating views of multiple participants which enriches the reflection. Accordingly, facilitators can ask searching questions (e.g. why questions) to achieve higher intensities as these aim to securitize the meaning of the experience. Some standard questions to evoke reflection can for example be:

- What is the experience regarding X?
- Why did things (not) go well?
- What can be learned from the experience?

Second, the results show that focus on the dialogue is important for reflection. Hence, ensuring attentive listening enables the facilitators to respond and ask follow-up questions which are appropriate to the reflection topic. This spurs the dialogue and increases the quality of reflection. Therefore, it is advised to minimize distractions during the dialogue to ensure full focus for the dialogue. Dividing tasks between the facilitators and preparing the gate review thoroughly could be measures to ensure focus on the dialogue.

Third, research finding indicated that when project members were not involved in concluding the reflection outcome they showed limited support for the outcome. Therefore, it is advised to involve and trigger project members to conclude reflection outcomes to increase their support for the conclusions and possible actions. Consequently, the project members are likely to be more motivated to perform the action or act upon the conclusion. This would likely ensure that lessons learned will be exploited and thus the potency for organisational learning might be better exploited.

Fourth, related to the latter, emphasizing on planning for actions and translating the outcome into behaviour contributes to the potency for organisational learning and exploiting the learning implication. Therefore, can facilitators best emphasize to collectively plan for action when lessons learned are drawn.

Finally, providing feedback to the project team enables them to frame what they did right and wrong. Accordingly, the project members shape and enrich their mental model on which they will base future actions. In other words, the participants know what to improve when they encounter a similar situation. Facilitators should thus provide feedback to the project members by emphasizing what goes well or not so well on the project.

In order to make the facilitators aware of these five focus areas to increase the reflection support training could be provided. During the training a list of standard questions can be given which promote asking searching question, drawing conclusions and planning for action.

**(5) The balance between assessing the project and learning from experience**

The gate reviews serve two major purposes. On the one hand, the gate review aims to assess the project performance to determine whether the project team is in control. On the other hand, the gate review aims to facilitate learning and continues improvement. Balancing these goals is complex as learning from the experience goes beyond assessing whether tasks are sufficiently performed. When the participants focus on assessing the project performance it seems to limit the extent of reflection, and consequently the learning potential of experiences of often not valued. When facilitators only ask if certain tasks are executed without questioning if there were any difficulties or things to change, the reflection is limited. Enhancing the reflection and ultimately learning requires participants to consider the gate review as an opportunity to reflect and to improve as individual, project or organisation. Moreover, the participants need

to learn to value the learning potential of experiences. Hence, it is advised that participants should be open-minded and should question more what can be learned from experiences. This could be achieved by asking what could be learned from a relevant experience. Moreover, this requires emphasizing that the intent of the gate review is also to learn from experiences and to improve the project. Shifting the focus to reflection and learning from experience, does not nullify the goal to assess the project performance.

**(6) Focus on good practices**

As elaborated in the results, good practices of the project received minor attention during the gate review. Nevertheless, best practices can also be fruitful for organisational learning. Therefore, it is advised to consider and reflect on good practices which are expected to have learning potential. Not all good practices have to be considered, mainly the outstanding ones and those that are considered valuable for other projects or the organisation by the participants. The focus on good practices is mainly relevant for projects that perform well because it ensures motivation of the participant. To clarify, the results show that project members tend to lose interest to perform reflection when their project performs considerably well, as there is limited incentive to improve upon their project. Consequently, focussing on best practices can make them feel proud, as they might contribute to other projects. Moreover, this reduces the risk of feeling that the gate review is superfluous and keeps the project members motivated to conduct future gate reviews.

# 7 CONCLUSIONS

This study was performed to provide insight into the extent of reflection within the gate reviews, the influencing conditions, the potential of reflection for organisational learning, and how reflection can be promoted in the gate reviews in order to exploit the potential for organisational learning. To perform the research, a framework has been developed based on literature which conceptualizes the relation between the conditions of reflection, the extent of reflection, and the integrative power of reflection. Subsequently, this framework was utilized within a multiple case study to answer each of the research questions below. Additionally, this conclusion closes with directions for future research.

**To what extent does reflection take place during the gate reviews and which conditions influence the extent?**

The extent of reflection varied across the gate reviews and within reflection cycles. The results indicate that as the reflection process progresses from 'articulating the experience' to 'drawing a collective reflection outcome', each subsequent stage was performed less within the gate reviews. Hence, in approximately half of the reflection cycles, the reflection prematurely came to an end as not all the reflection stages were achieved. In particular, the stages *collaborative re-evaluating the experience* and *drawing a reflection outcome* were performed the least within the reflection cycles. Moreover, as the reflection intensity increases, the number of reflection cycles achieving that intensity decreases. Hence, the participants achieved the higher reflection intensities, mainly *critical reflection*, the least. Nevertheless, achieving the highest intensity is not always needed due to the nature of certain experiences. It is not relevant to reflect on a rather simple problem related to the project at a critical reflection intensity as it might not have to be placed in the wider context of the organisation.

The extent of reflection is mainly influenced by conditions regarding the opportunity and motivation to reflect. The ability to reflect has a smaller influence on the extent of reflection. The reflection support provided by the facilitators positively contributed to creating an opportunity to reflect. Particularly when facilitators posed searching questions it stimulated scrutinizing the underlying roots of the experience and enhanced the reflection. Moreover, the facilitators' participating role contributed to reflection and the integration of knowledge across projects as they referred to other project experiences and organisational knowledge frequently. The intrinsic motivation and learning attitude of participants also positively influenced the extent of reflection, when the gate review was prepared in advance by the project team or when the project team experienced relatively many challenges on the project. The communicative ability of participants and in particular a mutual dialogue between the project members contributed positively to the extent of reflection. This is because multiple views are incorporated and existing interpretations are more frequently challenged. Even though the available time and trust between participants did not enhance the extent of reflection, the research suggests that these are essential preconditions for reflection to take place. Reflection experience, openness about mistakes and extrinsic motivation did not considerably influence the extent of reflection.

**What is the integrative power of reflection in order to promote organisational learning in project-based organisations?**

The results of the study suggest that there exists a positive relation between the extent of reflection and the integrative power of reflection. More specifically, achieving more reflection stages, increases drawing lessons learned for both the project on which reflection takes places as well as the organisation. Lessons learned were mainly related to the reflection stages 'collaborative re-evaluating the experience' and 'drawing the collective reflection outcome'. Also, when the reflection intensity increased, more lessons learned were drawn for the organisation and are mainly concentrated within the critical reflection intensity. Project lessons were predominantly provided within reflection cycles with dialogic reflection. When the intensity further increases to critical reflection the lessons learned almost always go beyond the project and regard the organisational level. In addition, when the participants re-evaluated the experience and drawn the collective reflection outcome, they linked other project experiences and organisational knowledge to make sense of the experience, give advice or emphasize the relevance of experience. The latter reason is also a stimulus for drawing lessons learned for the organisation. That is, as participants relate their experience to those of other projects it increases their motivation to address the situation in the organisational context, and consequently, articulate lessons learned for the organisation.

Thus, reflection drives processes to integrate experiences and knowledge across projects and the organisation. It establishes connections between projects and the organisation and seems fruitful for

organisational learning. The reflection during the gate reviews therefore contributes to the organisational learning processes of integration and some extent to institutionalization Hence, it is concluded that organized reflection on experiences gained during the project, embedded within the project process, positively contributes to the organisational learning process within project-based organisations such as construction companies.

**How can reflection be promoted within the gate reviews in order to exploit the potential for organisational learning?**

In order to increase the extent of reflection and consequently exploit the potential for organisational learning, several aspects of the conditions should be taken into account and emphasized. First, it is advised to conduct gate reviews with two facilitators to ensure attentive listening and focus on the dialogue. These facilitators preferably have experiences related to the reviewed project to enhance linking other project experiences during the reflection. Second, training can be provided to the facilitators on asking searching questions, attentive listening, providing feedback, concluding and planning for action to increase the reflection support. Third, participants need to take time for reflection by predetermining the estimated time required to sufficiently discuss all topics. Fourth, participants need to value what can be learned from experiences by shifting the focus from assessing what is done on the project to learning. Fifth, project teams can prepare the gate reviews in advance, which results in greater motivation to reflect and likeliness to achieve a greater extent of reflection. Finally, good practices of the project should also receive attention during the gate review as these often provide fruitful lessons for the organisation.

**Directions for future research**

Three suggestions for future research are made based on the limitations and scope of this research.

First, the research findings are based on limited case variation as the cases all concern the gate reviews. Hence, additional research is needed to validate whether reflection in different organisational contexts within the construction industry also suggests that reflection contributes to organisational learning. Moreover, future research could determine if reflection for organisational learning can also be achieved in other settings than the gate reviews.

Second, this research mainly focussed on the role of reflection in the gate review for bottom-up organisational learning. However, there is limited known about how the lessons learned derived during reflection in the gate review are, or can be, institutionalised within the organisation. Management currently evaluates the outcome and findings of the gate reviews, which seems promising for the institutionalisation of externalized experiences from the project teams. Future research could determine how lessons become institutionalized and what the value of the evaluation sessions are regarding the institutionalisation of experiences.

Third and final, this research has provided cues for which conditions affect the reflection, however, considered the conditions primarily from a single perspective. Future research can employ qualitative comparative analysis to consider the causal complexity of the conditions to get an understanding of which sets of conditions impact the extent of reflection.

# 8 REFERENCES


Afuah, A. (2003). Innovation Management: Strategies, Implementation, and Profits.

Argote, L., McEvily, B., & Reagans, R. J. M. s. (2003). Managing knowledge in organizations: An integrative framework and review of emerging themes. *49*(4), 571-582.

Argyris. (1999). Tacit knowledge and management. *Tacit knowledge in professional practice*, 123-140.

Argyris, & Schön, D. (1996). Organizational learning II: Theory, method and practice. *Reading: Addison Wesley, 305*(2).

Atkins, S., & Murphy, K. J. J. o. a. n. (1993). Reflection: a review of the literature. *18*(8), 1188-1192.

Ayas, K. (1996). Professional project management: a shift towards learning and a knowledge creating structure. *International Journal of Project Management, 14*(3), 131-136.

Ayas, K., & Zeniuk, N. (2001). Project-based learning: Building communities of reflective practitioners. *Management learning, 32*(1), 61-76.

Bakker, R. M., Cambré, B., Korlaar, L., & Raab, J. (2011). Managing the project learning paradox: A set-theoretic approach toward project knowledge transfer. *International Journal of Project Management, 29*(5), 494-503.

Balzert, S., Fettke, P., & Loos, P. (2011). *Enhancement of Traditional Business Process Management with Reflection-a New Perspective for Organisational Learning.* Paper presented at the European Conference on Technology Enhanced Learning (EC-TEL).

Bartsch, V., Ebers, M., & Maurer, I. (2013). Learning in project-based organizations: The role of project teams' social capital for overcoming barriers to learning. *International Journal of Project Management, 31*(2), 239-251.

Bittner, E. A. C., & Leimeister, J. M. (2013). *Why shared understanding matters--Engineering a collaboration process for shared understanding to improve collaboration effectiveness in heterogeneous teams.* Paper presented at the 2013 46th Hawaii International Conference on System Sciences.

Blayse, A. M., & Manley, K. (2004). Key influences on construction innovation. *Construction innovation, 4*(3), 143-154.

Boh, W. F. J. I., & organization. (2007). Mechanisms for sharing knowledge in project-based organizations. *17*(1), 27-58.

Bontis, N., Crossan, M. M., & Hulland, J. (2002). Managing an organizational learning system by aligning stocks and flows. *Journal of management studies, 39*(4), 437-469.

Boud, D., Keogh, R., & Walker, D. (1985). *Reflection: Turning experience into learning*. Londen: Kogan Page.

Bougie, R., Sekaran, U., Riemer, F. J., Kostelis, K. T., Quartaroli, M. T., Niku, S. B., . . . Matthews, T. D. (2017). *Research Methodology & Academic Skills*: John Wiley & Sons,.

Brady, T., & Davies, A. J. O. s. (2004). Building project capabilities: from exploratory to exploitative learning. *25*(9), 1601-1621.

Cress, U., & Kimmerle, J. (2008). A systemic and cognitive view on collaborative knowledge building with wikis. *International Journal of Computer-Supported Collaborative Learning, 3*(2), 105.

Crossan, M. M., Lane, H. W., & White, R. E. (1999). An organizational learning framework: From intuition to institution. *Academy of management review, 24*(3), 522-537.

Daudelin, M. W. (1996). Learning from experience through reflection. *Organizational dynamics, 24*(3), 36-48.

Davis, E. A. (2006). Characterizing productive reflection among preservice elementary teachers: Seeing what matters. *Teaching and teacher education, 22*(3), 281-301.

Davis, P., Gajendran, T., Vaughan, J., & Owi, T. (2016). Assessing construction innovation: theoretical and practical perspectives. *Construction Economics and Building, 16*(3), 104-115.
de Groot, E., Endedijk, M. D., Jaarsma, A. D. C., Simons, P. R.-J., & van Beukelen, P. (2014). Critically reflective dialogues in learning communities of professionals. *Studies in continuing education, 36*(1), 15-37.
Dewey, J. (1933). *How we think : a restatement of the relation of reflective thinking to the educative process*.
Dubois, A., & Gadde, L.-E. (2002). The construction industry as a loosely coupled system: implications for productivity and innovation. *Construction Management & Economics, 20*(7), 621-631.
Easterby-Smith, M., & Lyles, M. A. (2011). *Handbook of organizational learning and knowledge management*: Wiley Online Library.
Eisenhardt, K. M. J. A. o. m. r. (1989). Building theories from case study research. *14*(4), 532-550.
Eraut, M. (2004). Informal learning in the workplace. *Studies in continuing education, 26*(2), 247-273.
Eraut, M., & Hirsh, W. (2010). The significance of workplace learning for individuals, groups and organisations.
Fleck, R., & Fitzpatrick, G. (2010). *Reflecting on reflection: framing a design landscape.* Paper presented at the Proceedings of the 22nd Conference of the Computer-Human Interaction Special Interest Group of Australia on Computer-Human Interaction.
Gann, D. M., & Salter, A. J. (2000). Innovation in project-based, service-enhanced firms: the construction of complex products and systems. *Research policy, 29*(7-8), 955-972.
Gibbs, G. (1988). *Learning by doing. A guide to teaching and learning methods*. Oxford: Oxford Polytechnic.
Grabher, G. (2004). Temporary architectures of learning: Knowledge governance in project ecologies. *Organization studies, 25*(9), 1491-1514.
Groen, M. (2015). *Reflecteren: de basis. Op weg naar bewust en bekwaam handelen* (3th ed.). Groningen: Noordhoff Uitgevers bv.
Guldberg, K., & Pilkington, R. (2007). Tutor roles in facilitating reflection on practice through online discussion. *Journal of Educational Technology Society*
*10*(1), 61-72.
Gulwadi, G. B. J. I. J. o. S. i. H. E. (2009). Using reflective journals in a sustainable design studio.
Hartmann, A., & Dorée, A. (2015). Learning between projects: More than sending messages in bottles. *International Journal of Project Management, 33*(2), 341-351.
Hatton, N., & Smith, D. (1995). Reflection in teacher education: Towards definition and implementation. *Teaching and teacher education, 11*(1), 33-49.
Helyer, R. (2015). Learning through reflection: the critical role of reflection in work-based learning (WBL). *Journal of Work-Applied Management*.
Hilden, S., & Tikkamäki, K. (2013). Reflective practice as a fuel for organizational learning. *Administrative sciences, 3*(3), 76-95.
Høyrup, S. (2004). Reflection as a core process in organisational learning. *Journal of workplace learning*.
Høyrup, S., & Elkjær, B. (2006). Reflection: Taking it beyond the individual. In *Productive reflection at work* (pp. 43-56): Routledge.
Hsieh, H.-F., & Shannon, S. E. (2005). Three Approaches to Qualitative Content Analysis. *15*(9), 1277-1288. doi:10.1177/1049732305276687
Järvinen, A., & Poikela, E. (2001). Modelling reflective and contextual learning at work. *Journal of workplace learning*.
Jensen, S. K., & Joy, C. J. J. o. N. E. (2005). Exploring a model to evaluate levels of reflection in baccalaureate nursing students' journals. *44*(3), 139-142.

Jung, Y., & Wise, A. F. (2020). *How and how well do students reflect? multi-dimensional automated reflection assessment in health professions education*. Paper presented at the Proceedings of the Tenth International Conference on Learning Analytics & Knowledge, Frankfurt, Germany. https://doi.org/10.1145/3375462.3375528

Justice, S., Bang, A., Lundgren, H., Marsick, V. J., Poell, R., & Yorks, L. (2019). Operationalizing reflection in experience-based workplace learning approach: A hybrid. *Human Resource Development International*.

Keating, C., Robinson, T., & Clemson, B. J. T. L. O. (1996). Reflective inquiry: a method for organizational learning.

Kelloway, E. K., & Barling, J. (2000). Knowledge work as organizational behavior. *International journal of management reviews, 2*(3), 287-304.

Kember, D., McKay, J., Sinclair, K., Wong, F. K. Y. J. A., & Education, E. i. H. (2008). A four-category scheme for coding and assessing the level of reflection in written work. *33*(4), 369-379.

Knipfer, K., Kump, B., Wessel, D., & Cress, U. (2013). Reflection as a catalyst for organisational learning. *Studies in continuing education, 35*(1), 30-48.

Koenen, I. (2019). Zeesluis IJmuiden geen uitzondering: De 12 grootste bouwblunders van 2018. *Cobouw*. Retrieved from https://www.cobouw.nl/bouwbreed/nieuws/2019/01/zeesluis-ijmuiden-geen-uitzondering-de-12-grootste-bouwblunders-van-2018-auw-101268551?vakmedianet-approve-cookies=1&_ga=2.141613558.557070496.1568231000-970515720.1568231000

Kolb, D. A. (1984). *Experiential learning : experience as the source of learning and development*: Englewood Cliffs, N.J. : Prentice-Hall, [1984] ©1984.

Koole, S., Dornan, T., Aper, L., Scherpbier, A., Valcke, M., Cohen-Schotanus, J., & Derese, A. J. B. m. e. (2011). Factors confounding the assessment of reflection: a critical review. *11*(1), 104.

Korthagen, F., Vasalos, A., & Trainingen, V. (2002). Niveaus in reflectie: naar maatwerk in begeleiding. *VELON Tijdschrift voor lerarenopleiders, 23*(1), 29-38.

Krogstie, B. R., Prilla, M., & Pammer, V. (2013). *Understanding and supporting reflective learning processes in the workplace: The csrl model.* Paper presented at the European conference on technology enhanced learning.

Kump, B., Knipfer, K., Pammer, V., Schmidt, A., Maier, R., Kunzmann, C., . . . Lindstaedt, S. N. (2011). *The role of reflection in maturing organizational know-how.* Paper presented at the Proceedings of the 1st European Workshop on awareness and reflection in learning networks.

Lee, H.-J. (2005). Understanding and assessing preservice teachers' reflective thinking. *Teaching and teacher education, 21*(6), 699-715.

Leicht, R., & Harty, C. (2017). Influence of multiparty IPD contracts on construction innovation.

Lindner, F., & Wald, A. (2011). Success factors of knowledge management in temporary organizations. *International Journal of Project Management, 29*(7), 877-888.

Loeber, A., Mierlo, B. v., Grin, J., & Leeuwis, C. (2007). The practical value of theory: conceptualising learning in the pursuit of a sustainable development. In A. Wals (Ed.), *Social Learning Towards a More Sustainable World* (pp. pp. 83-98). Wageningen: Wageningen Academic Publishers.

Love, P. E., Ackermann, F., Teo, P., & Morrison, J. (2015). From individual to collective learning: A conceptual learning framework for enacting rework prevention. *Journal of Construction Engineering and Management, 141*(11), 05015009.

Mackintosh, C. (1998). Reflection: a flawed strategy forthe nursing profession. *Nurse education today, 18*(7), 553-557.

Mainga, W. (2017). Examining project learning, project management competencies, and project efficiency in project-based firms (PBFs). *International Journal of Managing Projects in Business*.

McGregor, D., & Cartwright, L. (2011). *Developing Reflective Practice: A Guide For Beginning Teachers: A Guide for Beginning Teachers*: McGraw-Hill Education (UK).
Mezirow, J. (1990). *Fostering critical reflection in adulthood*: Jossey-Bass Publishers San Francisco.
Moon, J. (1999). *Reflection in Learning and Professional Development*. London: Routledge.
Moud, H. I., & Abbasnejad, B. (2012). Factors Affecting Knowledge Transfer in Project Based Organizations (PBOs). *Gothenburg: Chalmers University of Technology, Departement of Construction Management*.
Muir, T., & Beswick, K. (2007). Stimulating reflection on practice: Using the supportive classroom reflection process. *Mathematics Teacher Education and Development, 8*.
Newell, S. (2004). Enhancing cross-project learning. *Engineering Management Journal, 16*(1), 12-20.
Newell, S., Bresnen, M., Edelman, L., Scarbrough, H., & Swan, J. (2006). Sharing knowledge across projects: limits to ICT-led project review practices. *Management learning, 37*(2), 167-185.
Nolan, A., & Sim, J. J. A. J. o. E. C. (2011). Exploring and evaluating levels of reflection in preservice early childhood teachers. *36*(3), 122-130.
Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*: Oxford university press.
Prilla, M., Nolte, A., Blunk, O., Liedtke, D., & Renner, B. (2015). *Analyzing collaborative reflection support: a content analysis approach.* Paper presented at the ECSCW 2015: Proceedings of the 14th European Conference on Computer Supported Cooperative Work, 19-23 September 2015, Oslo, Norway.
Prilla, M., Pammer, V., & Balzert, S. (2012). *The push and pull of reflection in workplace learning: Designing to support transitions between individual, collaborative and organisational learning.* Paper presented at the European Conference on Technology Enhanced Learning.
Raelin, J. A. (2002). 'I Don't Have Time to Think!'(vs. The Art of Reflective Practice). *Reflections, 4*(1), 66-79.
Ren, X., Deng, X., & Liang, L. (2018). Knowledge transfer between projects within project-based organizations: the project nature perspective. *Journal of Knowledge Management*.
Reynolds, M. (1998). Reflection and critical reflection in management learning. *Management learning, 29*(2), 183-200.
Ruuska, I., & Vartiainen, M. J. I. j. o. p. m. (2005). Characteristics of knowledge sharing communities in project organizations. *23*(5), 374-379.
Scarbrough, H., Bresnen, M., Edelman, L. F., Laurent, S., Newell, S., & Swan, J. (2004). The processes of project-based learning: An exploratory study. *Management learning, 35*(4), 491-506.
Schön, D. A. (1987). Educating the reflective practitioner.
Siriwardena, M. L. (2015). *Organisational learning in construction: a framework from the process improvement perspective.* University of Salford,
Söderlund, J., Vaagaasar, A. L., & Andersen, E. S. J. I. J. o. P. M. (2008). Relating, reflecting and routinizing: Developing project competence in cooperation with others. *26*(5), 517-526.
Sumsion, J., & Fleet, A. (1996). Reflection: can we assess it? Should we assess it? *Assessment & Evaluation in Higher Education, 21*(2), 121-130.
Swan, J., Scarbrough, H., & Newell, S. (2010). Why don't (or do) organizations learn from projects? *Management learning, 41*(3), 325-344.
Swieringa, J., & Wierdsma, A. F. M. (1990). *Op weg naar een lerende organisatie: over het leren en opleiden van organisaties*: Wolters Noordhoff.
Thompson, & Pascal, J. (2012). Developing critically reflective practice. *Reflective Practice, 13*(2), 311-325. doi:10.1080/14623943.2012.657795

Tigelaar, D. E. H., Dolmans, D. H. J. M., Meijer, P. C., de Grave, W. S., & van der Vleuten, C. P. M. (2008). Teachers' Interactions and their Collaborative Reflection Processes during Peer Meetings. *Advances in Health Sciences Education, 13*(3), 289-308. doi:10.1007/s10459-006-9040-4

Tsingos, C., Bosnic-Anticevich, S., Lonie, J. M., & Smith, L. J. A. j. o. p. e. (2015). A model for assessing reflective practices in pharmacy education. *79*(8).

van Heel, P., Buijs, M., & Wolf, C. (2019). *Verspilde moeite, over faalkosten in de bouwsector*. Retrieved from https://insights.abnamro.nl/2019/04/faalkosten-in-de-bouw-lopen-jaarlijks-op-tot-miljarden-euros/

Vera, D., Crossan, M., & Apaydin, M. (2011). A framework for integrating organizational learning, knowledge, capabilities, and absorptive capacity. *Handbook of organizational learning and knowledge management, 2*, 153-180.

Verschuren, P., Doorewaard, H., & Mellion, M. (2010). *Designing a research project* (Vol. 2): Eleven International Publishing The Hague.

Vince, R. (2002). Organizing Reflection. *33*(1), 63-78. doi:10.1177/1350507602331003

Wain, A. (2017). Learning through reflection. *British Journal of Midwifery, 25*(10), 662-666.

Walker, D. H. (2016). Reflecting on 10 years of focus on innovation, organisational learning and knowledge management literature in a construction project management context. *Construction innovation*.

Wallman, A., Lindblad, Å. K., Gustavsson, M., & Ring, L. (2009). Factors associated with reflection among students after an advanced pharmacy practice experience (APPE) in Sweden. *American journal of pharmaceutical education, 73*(6).

Ward, J. R., & McCotter, S. S. (2004). Reflection as a visible outcome for preservice teachers. *Teaching and teacher education, 20*(3), 243-257.

Williams, T. J. I. T. o. e. m. (2008). How do organizations learn lessons from projects—And do they? *, 55*(2), 248-266.

Winch, G. (1998). Zephyrs of creative destruction: understanding the management of innovation in construction. *Building Research & Information, 26*(5), 268-279. doi:10.1080/096132198369751

Woerkom, M. v. (2003). *Critical reflection at work : bridging individual and organisational learning.* University of Twente, Enschede. Available from http://worldcat.org /z-wcorg/ database.

Woerkom, M. v., & Croon, M. (2008). Operationalising critically reflective work behaviour. *Personnel Review*.

Wong, F. K., Kember, D., Chung, L. Y., & CertEd, L. Y. J. J. o. a. n. (1995). Assessing the level of student reflection from reflective journals. *22*(1), 48-57.

Yanow, D., & Tsoukas, H. (2009). What is reflection-in-action? A phenomenological account. *Journal of management studies, 46*(8), 1339-1364.

Yin, R. K. (2003). *Case study research: design and methods*. Thousand Oaks, Calif.: Sage Publications.

Zhao, D., Zuo, M., & Deng, X. N. (2015). Examining the factors influencing cross-project knowledge transfer: An empirical study of IT services firms in China. *International Journal of Project Management, 33*(2), 325-340.

# APPENDIX A OPERATIONALIZATION OF CONCEPTUAL FRAMEWORK

## A.1 Operationalization of the stages of collaborative reflection

| *Stage* | *Description* | *Indicators* | *Example* | *Reference* |
|---|---|---|---|---|
| **Articulating experience** | Participants articulate and make available how they understand the experience by describing their experience of the event, how they feel about the experience, and what the contractual factors for the event were. | Articulating bad practice of the experience in order to identify or clarify of the concern | | Knipfer et al. (2013); Koole et al. (2011) |
| | | Articulating challenges or problems of the experience in order to identify or clarify of the concern | | Knipfer et al. (2013); Koole et al. (2011) |
| | | Articulating good practice of the experience in order to identify or clarify of the concern | | Knipfer et al. (2013); Koole et al. (2011) |
| | | Describing the experience by mentioning what happened or what the problem is | | de Groot et al. (2014); Prilla et al. (2015); Woerkom and Croon (2008) |
| | | Mentioning the contextual factors of the experience in order to understand the influencing factors on the experience | | Koole et al. (2011); Prilla et al. (2015) |
| | | Mentioning own feelings and thoughts of the situation or event in order to create awareness of uncomfortable feelings and thoughts | | Atkins and Murphy (1993); Boud et al. (1985) |
| **Developing shared understanding** | Participants discuss the experience and reach a shared understanding of the experience, so everyone has the same frame of the experience before the re-evaluation of the experience | Mutual discussion on what happened during the experience by asking questions, careful listening and evaluation of others understanding with own perspective | | Bittner and Leimeister (2013); Knipfer et al. (2013) |
| | | Justification of the experience by elaborating on why actions taken were reasonable | | Krogstie et al. (2013) |
| | | Reach agreement or show convergence of what the experience was | | Bittner and Leimeister (2013); Knipfer et al. (2013); Krogstie et al. (2013) |
| **Collaborative re-evaluating experience** | Participants critically evaluate the experience by referring to prior experiences and knowledge, detecting patterns, challenge groupthink and interpret the meaning of the experience. | Challenging existing interpretations of the experience to get a deeper understanding of the experience | | Prilla et al. (2015); Woerkom (2003); Woerkom and Croon (2008) |
| | | Adding perspectives for the evaluation of the experience | | Jung and Wise (2020); Prilla et al. (2015) |
| | | Consider alternatives what could have been done during the experience | | Jung and Wise (2020); Prilla et al. (2015) |
| | | Exploring causes and effects of the experience | | Boud et al. (1985); Jung and Wise (2020) |
| | | Evaluating the experience by linking an experience to other experiences | | Boud et al. (1985); Prilla et al. (2015); Tsingos et al. (2015) |
| | | Evaluating the experience by linking an experience to knowledge, rules or values | | Boud et al. (1985); Prilla et al. (2015); Tsingos et al. (2015) |
| | | Posing searching questions to identify the underlying reasons for the experiences | | Koole et al. (2011) |
| **Drawing collective reflection outcome** | Participants agree on if and what the satisfactory outcome is of the re-evaluation. Resulting in, a better or different understanding of experiences, new perspectives, change in behaviour or plan for action | Agreement on the reflection outcome by showing convergence in understanding | | Daudelin (1996); Prilla et al. (2015) |
| | | Giving advice or proposing solutions for the reflection outcome | | Daudelin (1996); Prilla et al. (2015) |
| | | Planning for action in order to translate reflection outcome | | Koole et al. (2011); Korthagen et al. (2002) |
| | | Summarizing findings and implications from reflection outcome | | Prilla et al. (2015) |
| | | Translation of new insights (e.g. solutions for the problem) into behaviour that has been informed by reflection | | Koole et al. (2011); Korthagen et al. (2002) |

## A.2 Operationalization of the reflection intensities

| *Intensity* | *Description* | *Indicators* | *Reference* |
|---|---|---|---|
| **0. Revisiting** | The sole describing of an experience without further explanation. This first intensity is not considered as reflection and thus noted as level 0. | Articulation of a situation or event without justification of rationales and further exploration of the experience | Fleck and Fitzpatrick (2010) |
| | | The value of the experience is not considered | Muir and Beswick (2007) |
| **1. Descriptive reflection** | Description of the experiences including explanation and justification of actions or interpretation. Nevertheless, expressed in a descriptive way without exploring alternative explanations and taking one perspective. | Explaining the experience | Fleck and Fitzpatrick (2010) |
| | | Single perspective is taken for the justification and interpretation of the experience | Ward and McCotter (2004) |
| | | No alternative explanations explored | Lee (2005) |
| | | Single loop learning: not questioning underlying values of the system and questioning of 'doing things right' | Argyris (1999) |
| **2. Dialogic reflection** | Deliberate 'stepping back' from the experience and ponder. It mainly involves reflecting from multiple perspectives seeking alternative explanations and searching for relationships between prior knowledge and experience in order to generalize from them and reach an enriched understanding from the experience. | Deliberate reflection by stepping back form the experience, taking time to think about it | Daudelin (1996); Raelin (2002) |
| | | Relating the experience to prior experiences and knowledge | Hatton and Smith (1995) |
| | | Multiple perspectives are taken for the justification and interpretation of the experience (e.g. considering alternatives) | Hatton and Smith (1995) |
| | | Double-loop learning: questioning if one is doing the right thing by challenging assumptions and consideration of the causes and effects of the experience | Argyris (1999) |
| **3. Critical reflection** | The scrutiny and critique of the presuppositions on which beliefs have been built. Questioning 'contextual taken-for-granted' assumptions. Achieving fundamental change by challenging and questioning assumptions resulting in changed understanding or behaviour. Additionally, considering the wider picture; taking into account how actions influence the environment we act in | All of intensity 2. 'dialogic reflection', but with the questioning of 'contextual taken-for-granted' assumption | Mezirow (1990); Reynolds (1998) |
| | | Triple-loop learning: questioning if one is doing things with the right justification of norms and values. | McGregor and Cartwright (2011) |
| | | Showing awareness of the organisational environment | Fleck and Fitzpatrick (2010) |

## A.3 Operationalization of the conditions of reflection

| | ***Condition*** | ***Description*** | ***Indicators*** | ***Reference*** |
|---|---|---|---|---|
| **Opportunity** | Available time | Enough time is used for reflection, so a reflection outcome can be achieved | No mentioning of having to move on due to time constraints | Groen (2015); Knipfer et al. (2013); Moon (1999) |
| | | | All topics of interest are discussed sufficiently according to the participants | |
| | Challenge in work | The work provides challenge to create experiences and learn from them | Project uniqueness according to the project members | Eraut (2004) |
| | | | Gate review outcome | |
| | | | Project complexity according to the project members | |
| | Support to reflect | Reflection is guided and stimulated by facilitators | Asking question regarding the development of supposition, attending feelings and thoughts, future behaviour and critical judgements | Koole et al. (2011); Moon (1999); Wallman et al. (2009) |
| | | | Giving room for participants to speak (e.g. pausing and listening) | |
| | | | Confronting participants with misconceptions | |
| **Ability** | Reflection experience | More reflection experience enhances the participants ability to reflect | Gate review experience | Knipfer et al. (2013) |
| | Communication | Ability of clearly communicate, make oneself understandable to others and | Attentiveness | Groen (2015) |
| | | | Clear formulation and thinking out loud | Groen (2015) |
| | | | Common language and mutual dialogue | Argote, McEvily, and Reagans (2003) |
| | Openness about mistakes | Mistakes made on the project are shared in order to learn from them | Participants mention they were open about their mistakes | de Groot et al. (2014); Woerkom and Croon (2008) |
| | Abstract thinking | Searching for explanations, using analogies, searching for alternative explanations, organize the topics and relates them, evaluation of relations. | Prior experience to make sense | Groen (2015); Knipfer et al. (2013) |
| | | | Educational level | |
| **Motivation** | Extrinsic motivation | External motivation and encouragement to engage in reflection and open-up | Incentives are provided to encourage participants to reflect | Argote et al. (2003) |
| | Intrinsic motivation | Willingness to reflect out of own interest and find it internally rewarding | A sense of inner discomfort created by challenges, triggering the curiosity to explore the experience. | Koole et al. (2011) |
| | Learning attitude | The drive of participants to improve behaviour and actions | Open-mindedness to new insight | Moon (1999) |
| | | | Questioning existing behaviour and actions | Groen (2015) |
| | Trust | Participants can trust each other and a safe reflection environment exists to let participants reflect without judgements | Safe environment is created by the facilitators | Koole et al., (2011) |
| | | | Strong relationship between participants stimulate reciprocity (i.e. give and take) | Argote et al. (2003) |
| | | | Participants can be open about mistakes without fear of retaliation | Raelin (2002); Vince (2002); Woerkom and Croon (2008) |

# APPENDIX B DESCRIPTIVE CASE REPORTS (DUTCH)

This appendix has been removed for business confidential reasons

Van Hattum en Blankevoort

# APPENDIX C RESULTS PER REFLECTION CYCLE

The reflection activities of the stages of reflection are indicated by who performed the activity and how many times the activity occurred. ‘P’ indicates that the project team performed the activity and ‘F’ that the facilitators performed the activity. When the project team has performed the activity twice within a reflection cycle ‘2P’ is indicated and when both the project team and facilitators participated in the activity it is indicated by ‘PF’.

Each reflection cycle is characterised by a reflection intensity. A ‘0’ indicates a revisiting intensity, ‘1’ indicates descriptive reflection intensity, ‘2’ indicates dialogic reflection intensity and ‘3’ indicates critical reflection intensity.

The learning implication and used prior knowledge are indicated by ‘X’, when a number is placed for the ‘X’, for example ‘2X’ in reflection cycle 13 the participants referred twice to different organisational knowledge.

## C.1 Results per reflection cycle case A

| Element | Activity \ Reflection cycle | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stages of reflection | Articulate meaning – bad practice | P | P | PF | | P | P | 2P | | | P | | F | | P | | | | |
| | Articulate meaning – Challenges or problems | | P | | P | | | | | | | | | P | | | P | P | P |
| | Articulate meaning – Good practice | | | | | | | | | | | | | | | | | | |
| | Articulate meaning – Description of event | P | P | PF | | | F | P | P | | 2P | P | P | | P | P | | | |
| | Articulate meaning – Contextual factors | P | | | P | | | | | P | P | | P | P | | | | P | |
| | Articulate meaning – feelings or thoughts on event | | | | | | | P | | | | P | | | | | F | | |
| | Develop shared understanding – Discussion on what happened | PF | PF | | | PF | PF | | PF | | | | PF | | PF | | | PF | PF |
| | Develop shared understanding – Justification of the event | | | P | | P | | | | P | | | | | | P | P | | |
| | Develop shared understanding – reach agreement on experience | | | | | | PF | | | | | PF | | | | | | | |
| | Collaborative re-evaluating experience – Challenge existing interpretations | | | | | | | | | | | | F | | | | | F | |
| | Collaborative re-evaluating experience – Adding perspectives | | | F | | | | | | | | F | | | | | 1P1F | | |
| | Collaborative re-evaluating experience – Consider alternatives | | | | | | | | | | | | | | | | | | |
| | Collaborative re-evaluating experience – exploring causes and effects | | PPF | 2F | | | | F | | | | | | P | | | F | | F |
| | Collaborative re-evaluating experience – linking to knowledge, rules or values | | | F | | | | | | F | | 2F | F | | | F | F | | |
| | Collaborative re-evaluating experience – Linking to other experiences | | | F | F | | F | | | F | | F | | | F | | | F | |
| | Collaborative re-evaluating experience – Posing searching questions | | 2F | F | | | | | | F | | | | | F | | | F | |
| | Drawing collective reflection outcome – Agreement on reflection outcome | | 3PF | PF | | PF | | | | | | PF | | | PF | | PF | | |
| | Drawing collective reflection outcome – Giving advice or solutions | | F | F | | | F | 2F | | F | | F | | | | 2F | F | | |
| | Drawing collective reflection outcome – Planning for action | | PF | | | F | | F | | | | | | | | | | | |
| | Drawing collective reflection outcome – Summarizing findings and implications | | | F | | | | | | | | | F | | F | | | | |
| | Drawing collective reflection outcome – Translation of insight into behaviour | | | | | | P | | | | | | | | | | | | |
| Reflection intensity | 0. Revisiting | 1 | | | | | | | 1 | | 1 | | | | | | | | 1 |
| | 1. Descriptive | | | | 2 | 2 | | 2 | | 2 | | 2 | | 2 | 2 | 2 | | 2 | |
| | 2. Dialogic | | 3 | | | | 3 | | | | | | 3 | | | | 3 | | |
| | 3. Critical | | | 4 | | | | | | | | | | | | | | | |
| Integrative power of reflection | Lessons learned – Drawing lessons learned for project | | X | | | X | X | X | X | X | | X | X | | X | X | X | X | |
| | Lessons learned – Drawing lessons learned for organisation | | | X | | | | | | | | | X | | | | | | |
| | Linking experience and knowledge – Linking other project experiences | | | X | X | | 2X | | | X | | X | | | X | X | | X | |
| | Linking experience and knowledge – Linking organisational knowledge | | | | | | | | | | | 2X | X | | | | X | | |

Legend:
P: Project team
F: Facilitators
PF: Proiect team and facilitators

## C.2 Results per reflection cycle case B

| Element | Activity \ Reflection cycle | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stages of reflection | | | | | | | | | | | | | | | | | | | | | |
| | Articulate meaning: bad practice | | | | P | | P | | P | | | | | P | P | P | | P | P | P | |
| | Articulate meaning: Challenges or problems | | | | | | | P | | P | | | | | | | | | | | |
| | Articulate meaning: Good practice | | P | | | | | | | | | F | F | | | | | | | | P |
| | Articulate meaning: Description of event | P | P | P | | P | P | P | | P | P | P | P | | P | | P | P | | | |
| | Articulate meaning: Contextual factors | P | P | | | | | | | | | | | | | | | | P | | |
| | Articulate meaning: feelings or thoughts on event | | | | | | | | | P | | | | | | | | P | | | |
| | Develop shared understanding: Discussion on what happened | PF | PF | PF | | | | PF | PF | | | | | | PF | | PF | PF | | | |
| | Develop shared understanding: Justification of the event | | | | P | P | | PF | P | | | F | | F | P | | P | | | P | |
| | Develop shared understanding: reach agreement on experience | | | | | | | PF | | | F | | PF | | | | | | | | F |
| | Collaborative re-evaluating experience: Challenge existing interpretations | | F | | | | | | | | | | | | | | | | | | |
| | Collaborative re-evaluating experience: Adding perspectives | | F | | F | | | | | | | | | | | | F | 1P 1F | | | |
| | Collaborative re-evaluating experience: Consider alternatives | | | | | | | | | | | | | P | | | P | F | | | |
| | Collaborative re-evaluating experience: exploring causes and effects | | PF | | 1 P 1 F | | P | | | | | | | | PF | | | 2F | P | P | |
| | Collaborative re-evaluating experience: linking to knowledge, rules or values | | | | F | | | | | | | | | | | F | F | | | F | |
| | Collaborative re-evaluating experience: Linking to other experiences | | F | | | | F | | | F | F | | | | F | | | | | | |
| | Collaborative re-evaluating experience: Posing searching questions | | F | | | F | F | | | | P | | | | | | | | | | |
| | Drawing collective reflection outcome: Agreement on reflection outcome | | PF | | | PF | PF | | | | | | | | | | F | PF | PF | | |
| | Drawing collective reflection outcome: Giving advice or solutions | | | | P | | F | | | | | | | F | | | | | | | |
| | Drawing collective reflection outcome: Planning for action | | | | | | | | | | | | | | | | | | | | |
| | Drawing collective reflection outcome: Summarizing findings and implications | | | | | | | | | | | | | F | | | | | F | | |
| | Drawing collective reflection outcome: Translation of insight into behaviour | | | | | | | | | | | | | | | | | | | | |
| Reflection intensity | 0. Revisiting | 1 | | 1 | | | | | 1 | | | 1 | 1 | | | 1 | | | | | 1 |
| | 1. Descriptive | | | | | 2 | | 2 | | 2 | 2 | | | 2 | 2 | | | | | 2 | |
| | 2. Dialogic | | 3 | | 3 | | 3 | | | | | | | | | | 3 | | 3 | | |
| | 3. Critical | | | | | | | | | | | | | | | | | 4 | | | |
| Integrative power of reflection | Lessons learned: Drawing lessons learned for project | | | | X | X | | X | | | X | | | X | | | X | | | X | |
| | Lessons learned: Drawing lessons learned for organisation | | X | | | | X | | | | | | | | | | | X | X | | |
| | Linking experience and knowledge: Linking other project experiences | | 2X | | | X | X | | | X | X | | | | X | | | | | | |
| | Linking experience and knowledge: Linking organisational knowledge | | | | | | | | | | | | | | | X | | | | | |

Legend:
P: Project team
F: Facilitators
PF: Project team and facilitators

## C.3 Results per reflection cycle case C

| Element | Activity | Reflection cycle 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stages of reflection | Articulate meaning | bad practice: P | | P | P | | | | | | P | | P | P | | | | | | |
| | | Challenges or problems | | | | | | P | | | P | | | | | | | | | |
| | | Good practice | | | | | | | | | | | P | | | | | | | |
| | | Description of event: P | P | P | P | P | P | P | P | P | P | P | P | | PF | P | P | P | P | P |
| | | Contextual factors | P | | P | P | P | P | | | P | | | | | | | | | |
| | | feelings or thoughts on event | | | P | | | | | | | | | | | | | | | |
| | Develop shared understanding | Discussion on what happened: PF | PF | | PF | F | PF | | PF | PF | PF | PF | | | PF | | PF | | PF | PF |
| | | Justification of the event | | | F | | | | | F | | | | | | | | P | F | |
| | | reach agreement on experience | | | | | | | | | | | | | | | | | | |
| | Collaborative re-evaluating experience | Challenge existing interpretations | | | F | | | | | | | | | | | | | | | |
| | | Adding perspectives | | | 2 | | | P | | | P | F | | | | | | | | |
| | | Consider alternatives | | | F | | | | | | | | | | | | F | | | PF |
| | | exploring causes and effects | | | P | | P | P | | | 2P | PF | | P | | PF | | | F | F |
| | | linking to knowledge, rules or values | | | P | | | | | | | | | | | | | | | |
| | | Linking to other experiences | | | F | | | P | | | | F | F | | | | | | F | |
| | | Posing searching questions | | | | | | F | | | | | F | | | | | | F | F |
| | Drawing collective reflection outcome | Agreement on reflection outcome | | | F | | | | | | | F | | PF | | | | PF | F | |
| | | Giving advice or solutions | | | | | | | | | | F | P | | | | | F | | F |
| | | Planning for action | | | | | | | | | | | | | | | | | | |
| | | Summarizing findings and implications | | | | | | | | | F | | | | | | | | | |
| | | Translation of insight into behaviour | | | | | | | | | | | | | | | | | | |
| Reflection intensity | 0. Revisiting | | 1 | 1 | 1 | | 1 | | | 1 | 1 | | | | | 1 | | | | |
| | 1. Descriptive | | | | | | | 2 | 2 | | | | | 2 | | | 2 | 2 | 2 | | |
| | 2. Dialogic | | | | | 3 | | | | | | 3 | 3 | | 3 | | | | | 3 | 3 |
| | 3. Critical | | | | | | | | | | | | | | | | | | | |
| Integrative power of reflection | Lessons learned | Drawing lessons learned for project | | | X* | | | | | | | X | X | X | | | | X | X | X | |
| | | Drawing lessons learned for organisation | | | | | | | | | | | | | X | | | | | | X |
| | Linking experience and knowledge | Linking other project experiences | | | | | | | X | | | | | | | | | | | X | X |
| | | Linking organisational knowledge | | | | | | | | | | X | X | | | | | | | | |

Legend:
P: Project team
F: Facilitators
PF: Project team and facilitators

*This implication was mentioned during the feedback and not during the reflection cycle itself.

## C.4 Results per reflection cycle case D

| | Element | Activity \ Reflection cycle | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stages of reflection | Articulate meaning | bad practice | | P | P | | | | | O | | | | | | P | | | | P | | | | | | | | P |
| | | Challenges or problems | P | P | | | P | P | | | | | | | | | | | | | | | | | | P | | |
| | | Good practice | | P | | | | | | | | | | | | | P | | P | | | | | | | | | |
| | | Description of event | | P | | P | P | | P | O | P | P | P | P | P | P | P | P | P | | P | P | | P | | | P | |
| | | Contextual factors | | P | | | | P | | | | | | | | | P | | | | | | P | | | P | P | F |
| | | feelings or thoughts on event | | | | | | | | | P | | | | | | | | | | | | P | | P | | | |
| | Develop shared understanding | Discussion on what happened | | 2PF | PF | | | | PF | PF | | | PF | PF | PF | PF | | PF | | | PF | PF | | PF | | | PF | PF |
| | | Justification of the event | P | | P | | P | P | | | P | P | | | | | | F | | | | | | | P | | | |
| | | reach agreement on experience | | | | | | | | | | | | | | F | | | | | | | | | | | | |
| | Collaborative re-evaluating experience | Challenge existing interpretations | | | | | | | | | | | | | | | | | | F | | | | | P | | | |
| | | Adding perspectives | | | | | | 2P | | | | | | | | | | | | | | | | | | | | F |
| | | Consider alternatives | | | | | | | | | | | | | | | | | | | | | | | | | | P |
| | | exploring causes and effects | | | | | PF | 1P 1F | | | | | P | | P | | | | | PF | | | | P | F | P | | 1P 1F |
| | | linking to knowledge, rules or values | | | | | F | | | | | | | | | | | | | | | P | | | | | | |
| | | Linking to other experiences | | | F | F | | | | | | | | | | | | | | P | | | | | | P | F | F |
| | | Posing searching questions | | F | | | | | | | | | | | | | | | | | | P | | | | | | |
| | Drawing collective reflection outcome | Agreement on reflection outcome | | | | | | | | | | | | | | | | | | | | F | | | | | | |
| | | Giving advice or solutions | | | | F | P | P | | | | | | | | | | | | P | | | | | | | | |
| | | Planning for action | | | | | | | | F | | | | | | | | | | | | | | | | | | |
| | | Summarizing findings and implications | | | | | | | | F | | | | | | | | | | | | | | | | | | P |
| | | Translation of insight into behaviour | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reflection intensity | 0. Revisiting | | 1 | | | | | | 1 | | 1 | 1 | | 1 | | 1 | 1 | 1 | 1 | | 1 | | 1 | | | | | |
| | 1. Descriptive | | | 2 | 2 | 2 | 2 | | | 2 | | | 2 | | 2 | | | | | | | 2 | | 2 | 2 | 2 | 2 | |
| | 2. Dialogic | | | | | | | 3 | | | | | | | | | | | | 3 | | | | | | | | 3 |
| | 3. Critical | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Integrative power of reflection | Lessons learned | Drawing lessons learned for project | | | | X | | X | | X | | | | | | | | | | | | X | | | | | | |
| | | Drawing lessons learned for organisation | | | | | | | | | | | | | | | | | | X | | | | | | | | X |
| | Linking experience and knowledge | Linking other project experiences | | | X | X | | | | | | | | | | | | | | X | | | | | | X | X | X |
| | | Linking organisational knowledge | | | | | | | | | | | | | | | | | | | | | | | | | | |

Legend:
P: Project team
F: Facilitators
PF: Project team and facilitators

## C.5 **Results per reflection cycle case E**

| | Element | Activity \ Reflection cycle | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stages of reflection | Articulate meaning | bad practice | | P | | | | | | | | | P | | | |
| | | Challenges or problems | P | | P | | P | P | P | | P | | | | P | P |
| | | Good practice | | | | | | | | | | | | | | |
| | | Description of event | P | P | | P | P | | | P | P | P | P | P | P | |
| | | Contextual factors | | | | | | | | | | P | | | | |
| | | feelings or thoughts on event | | | | | | PF | | | | | | | | |
| | Develop shared understanding | Discussion on what happened | | | | P F | PF | PF | | | P F | PF | | | PF | PF |
| | | Justification of the event | | | | P | | | | P | 1 P 1 F | | | P | | |
| | | reach agreement on experience | | | | | | | | | | | 2P | | | |
| | Collaborative re-evaluating experience | Challenge existing interpretations | | | | | | | | F | | | | P | | |
| | | Adding perspectives | | | | | P | | | F | P | | P | 2F | | |
| | | Consider alternatives | | | | | | | | | | | | | PF | |
| | | exploring causes and effects | | | | | 1P 1F | PF | F | | 1 P 1 F | P | 2P | | PF | |
| | | linking to knowledge, rules or values | F | | P | | | | | F | | | F | | P | |
| | | Linking to other experiences | | | F | | | | | F | | | F | | | |
| | | Posing searching questions | | | | | F | | | | F | | | | | |
| | Drawing collective reflection outcome | Agreement on reflection outcome | | | | | | | | | P F | | P | | | |
| | | Giving advice or solutions | | | | | 2F | PF | | | | | | P | P | |
| | | Planning for action | | | | | F | F | | PF | | | | F | | |
| | | Summarizing findings and implications | | | | | F | | | | | | P | | | |
| | | Translation of insight into behaviour | | | | | F | | | | P | | PF | | | |
| Reflection intensity | 0. Revisiting | | 1 | 1 | | 1 | | | | | | | | | | 1 |
| | 1. Descriptive | | | | 2 | | | 2 | 2 | | | 2 | | | | |
| | 2. Dialogic | | | | | | 3 | | | 3 | | | | 3 | 3 | |
| | 3. Critical | | | | | | | | | | 4 | | 4 | | | |
| Integrative power of reflection | Lessons learned | Drawing lessons learned for project | | | X | | X | X | | X | | X | | X | X | |
| | | Drawing lessons learned for organisation | | | | | | | | X | X | | X | | | |
| | Linking experience and knowledge | Linking other project experiences | | | X | | | | | X | | | X | | | |
| | | Linking organisational knowledge | X | | X | | | | | | | | | | | |

Legend:
P: Project team
F: Facilitators
PF: Project team and facilitators

## C.6 Results per reflection cycle case F

| | Element | Activity \ Reflection cycle | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stages of reflection | Articulate meaning | bad practice | P | P | P | P | | | | | P | | | | | | | P | | | | | P | P | P | P |
| | | Challenges or problems | | | | | | | | P | | | | P | | | | | | | | | | | | | |
| | | Good practice | | | | | | P | P | | | | P | | | | | | | | | | | | | | |
| | | Description of event | P | | | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P |
| | | Contextual factors | | | | | | | | | | F | | | | | | | | | | | | | | | |
| | | feelings or thoughts on event | | P | | | | | | | | | | | | | | | | | | | | | | | |
| | Develop shared understanding | Discussion on what happened | PF | PF | | | | | | PF | | | | | PF | PF | PF | PF | | PF | PF | PF | | PF | | | |
| | | Justification of the event | P | | | P | P | P | | | | | | | P | | | | | | | | | | P | | |
| | | reach agreement on experience | | | | | | | | | | | | | | | | | | | | | | | | F | |
| | Collaborative re-evaluating experience | Challenge existing interpretations | | | | | | | | | P F | | | F | | | | | | | | | | | | | |
| | | Adding perspectives | | 2P | | | | | | P | | | | | | | | PF | | | | | | | | | |
| | | Consider alternatives | | P | | P | P | | | | P F | | | | | | | P | | | | | | | | P | |
| | | exploring causes and effects | | 2P | P | P | | | P | P | | PF | | | | | | 2P2F | P | | | PF | | | P | | P |
| | | linking to knowledge, rules or values | | F | | | | | | | | | | | | | | | | | | | | | | F | |
| | | Linking to other experiences | | F | F | | | | P | | | | | | | P | | P | | | | | | | | | |
| | | Posing searching questions | | 2F | | | F | | | | | | | | | | | P | | | | F | | | | | |
| | Drawing collective reflection outcome | Agreement on reflection outcome | | PF | | | | | | | | | | | | | | | | | | | | | PF | | |
| | | Giving advice or solutions | | P | | | | | | | | F | | F | | | | | | PF | | P | | | F | F | |
| | | Planning for action | | | | | | | | | | | | | | | | F | | | | | | | | F | |
| | | Summarizing findings and implications | | | | | | | | | | | | | | | | F | | | | | | | | F | |
| | | Translation of insight into behaviour | | | | | | | | | F | | | | | | | | F | | | | | | | | |
| Reflection intensity | 0. Revisiting | | | | | | | | | | | | 1 | | 1 | | 1 | | | | 1 | | 1 | 1 | | | |
| | 1. Descriptive | | 2 | | 2 | 2 | 2 | 2 | 2 | | | 2 | | 2 | | 2 | | | | 2 | | | | | 2 | | 2 |
| | 2. Dialogic | | | 3 | | | | | | 3 | 3 | | | | | | | | 3 | | | 3 | | | | 3 | |
| | 3. Critical | | | | | | | | | | | | | | | | | 4 | | | | | | | | | |
| Integrative power of reflection | Lessons learned | Drawing lessons learned for project | | | | X | | | X | X | | X | | (X) | | | | | | X | | X | | | X | X | |
| | | Drawing lessons learned for organisation | | | X | | | | | | X | | | | | | | X | X | | | | | | | | |
| | Linking experience and knowledge | Linking other project experiences | | X | X | | | | X | | | | | | | X | | X | | | | | | | | | |
| | | Linking organisational knowledge | | | | | | | | | | | | | | | | | | | | | | | | X | |

Legend:
P: Project team
F: Facilitators
PF: Proiect team and facilitators

# APPENDIX D SCORING CONDITIONS OF REFLECTION

The following table provides the reasoning behind the scoring of the condition presence and effect on the reflection for each case. For each condition first the presence is elaborated, followed in a row lower by the effect on the extent of reflection. A '-' indicates a low presence or negative effect, a '0' indicates an average presence or neutral effect and a '+' indicates a high presence or positive effect. Some of the conditions or effects could not be identified and are labelled with n/a.

| Category | Condition | Score Case A | Score Case B | Score Case C | Score Case D | Score Case E | Score Case F |
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| **Opportunity** | *Available time* | **0** Facilitators mentioned three times to continue with other topic which prematurely stopped the reflection. However, participants mentioned all topics were discussed sufficiently | **0** The gate review was a bit under pressure as the gate review from case C was held directly after case B. During the gate review the lack of time was mentioned three times. However, participants mentioned all topics were discussed sufficiently | **-** During the gate review the lack of time was mentioned twice. Additionally, one project member mentioned that the gate review felt rushed, decisions had to be made between discussed topics and there was a need to discuss topics more extensively. | 0 During the gate review the lack of time was mentioned twice. One member also noted that it is hard to share a lot of detailed information, however the dialogue did not feel rushed. | **0** During the gate review the lack of time was mentioned once. All the participants stated that enough time was available to discuss all topics sufficiently. | + Time constrains were not mentioned during the thermometersessie and the participants stated that all topics were sufficiently discussed. |
| | | **0** When the time was mentioned reflection was affected negatively, other reflection cycles where not affected. | **0** When the time was mentioned reflection was affected negatively and reflection cycles ended prematurely (e.g. cycle 10), other reflection cycles where not affected. | **-** When the time was mentioned reflection was affected negatively and reflection cycles ended prematurely (e.g. cycle 10), other reflection cycles where not notably affected. Yet, it is assumed that the time constrains negatively affected the reflection. | **0** When the time was mentioned reflection was affected negatively, other reflection cycles where not affected. | **0** The available time did not hinder the extent of reflection achieved. When the limited time got mentioned the reflection cycle was finished. Nevertheless, the time did also not contribute to a higher extent of reflection. Rather, it created opportunity to reflect. | 0 The available time did not enhance the extent of reflection, it created opportunity to happen. |
| | *Challenge in work* | **+** Project members perceive the project as complex, mainly because of their new role. Gate result is red, so lot of challenges on the project. | **0** The project team is in control as the gate review outcome is green. Some difficulties are experienced on the project due to time constrains, however the team members do not value the project as very complex. | **0** The project team considers the challenge on the project as average, the project performs well, and the gate review outcome is green. | **-** The project team considers the challenge on the project as low due to their subcontractor role within the project. Nevertheless, according to the facilitators they have underestimated the project and the gate review outcome is orange | 0 Project members perceive the complexity of the project differently. From ''the most complex project of the year'' to ''from my role the project is not complex''. Therefore, is the challenge in work noted as average. | 0 The project members perceive the complexity of the project as average, as the project has some special technical solutions, but the project itself is monodisciplinary. |
| | | **0** The challenge in work created experiences for the project members to mention during the gate review. The challenge itself did not affect the extent of reflection, however, did increase the intrinsic motivation and learning attitude to improve upon the project. | **0** The challenge in work created experiences for the project members to mention during the gate review. The challenge itself did not affect the extent of reflection. Since the project goes relatively well, also good practices are shared. | **0** The challenge in work created opportunity to gain experiences and share these during the gate review. The challenge itself did not affect the extent of reflection. However, one of the project members does not see the added value to reflect on good practices. Hence, the challenge in work does affect the learning attitude. | 0 The challenge in work did not affect the extent of reflection. Even though the challenges were considered low there were enough experiences to share during the gate review. | 0 The challenge in work did not noticeably affect the extent of reflection. | 0 The average challenge in work enabled the participants to gain experiences, which could be shared during the thermometersessie. However, the challenge in work did not increase the extent of reflection. |
| | *Reflection support* | **0** facilitators chair the gate review, guide the dialogue, ask open and closed questions and about the rationales of the events, provide feedback, give their opinions on the certain events, regularly refer to other projects or organisational knowledge, help to evaluate the event, provide solutions or give advice and draw conclusions. Nevertheless, the facilitators are predominant and lack giving room | **0** facilitators chair the gate review and divided tasks (taking minutes and conversation guidance), guide the dialogue, ask open and closed questions and about the rationales of the events, provide feedback, give their opinions on the certain events, regularly refer to other projects and once to organisational knowledge, help to evaluate the event, provide solutions or give advice and draw | **-** The facilitators chair the gate review and divided tasks, guide the dialogue, ask open and closed questions. Nevertheless, the facilitators were fatigued resulting in poor concentration for the dialogue, mainly in the beginning. They were also more focussed on checking project performance instead of learning from the experience due to questing how things happened | **-** The facilitators chair the gate review, guide the dialogue and ask open and closed questions. Nevertheless, the facilitators did not divide the tasks clearly between who guides the dialogue and who takes minutes. Consequently, the gate review was unstructured at the first 30 minutes. | **+ T**he facilitators have two years of experiences with gate reviews and thermometersessie. They supported the reflection mainly by asking open question, guiding the dialogue, helping to reflect on the experience and referring to other experiences. In addition, at the end the facilitators generally asked | **+ T**he facilitators have two years of experiences with gate reviews and thermometersessie. They supported the reflection mainly by asking open question, guiding the dialogue, helping to reflect on the experience and referring to other experiences. On the contrary, they did not provide |

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| | | for the project member to provide their insight, lack asking general questions about how the project is doing, do not pay attention to project members own experience to reflect on due to much focus on assessing the project, and do not ask the project members about their thoughts and conclusions. | conclusions. Nevertheless, the facilitators do not pay attention to project members own experience to reflect on due to much focus on assessing the project. One of the project members mentioned insufficient opportunity to reflect on own experiences. Facilitators do also not ask the project members about their thoughts and conclusions. | instead of why things happened in that way. This is also acknowledged by one of the project members that the dialogue was focussed on the assessment on the project, which limited gaining learning implications. In addition, the facilitators did not ask about the project members about their own thoughts and conclusions, and experiences they wanted to address. | Additionally, it was the first gate review for one of the facilitators, who clearly struggled with guiding the dialogue and asking the critical questions spurring the reflection. Moreover, the facilitators did not ask about the project members about their own thoughts and conclusions, and experiences they wanted to address. Finally, the facilitators were distracted from the conversation by focussing on looking into project documentation, which resulted multiple pauses of 10 seconds within the reflection. | the team how they think the project is going. On the contrary, they did not provide feedback, which is a missed opportunity according to the project team. | feedback, which is a missed opportunity according to the project team. |
| | | **+** All positive aspects given above have positive impact on the reflection. Some of the negative aspects do not impact the extent of reflection, however, also do not exploit the reflection to the fullest extent and two clearly hinder reflection. Those are: lack of room for project members to talk and not being attentive for project members own experiences brought in due to too much focus on the assessment form of the gate review procedure. | **+** All positive aspects given above have positive impact on the reflection, enabling to achieve a higher extent of reflection. Yet, the lack of attention for the project team own experiences reduce the relevance of the reflection. Also, by not involving the project team in concluding, actions are not taken as result of the gate review, reducing the learning potential. Nevertheless, the reflection did benefit from the support of the facilitators. | **0** The poor concentration of the facilitators which happened during the beginning mainly influenced the extent of reflection negatively. Also, the lack of involving the project team in the concluding stage minor reflection occurred for that stage. On the other hand, by guiding and asking questions the reflection was spurred. These positive and negative effects weighted are considered as a neutral effect. | - Although the facilitators to some extent supported the reflection, relatively the negative influences outweigh the positive effects. The unstructured gate review at the beginning resulted in both less reflection stages achieved and low intensities. The lack of experience influenced the ability to ask critical question to spur reflection and the distraction by the project document negatively affected the flow of the dialogue | **+** The reflection support contributed positively to the extent of reflection. Mainly the asking of open questions allowed participants to critically reflect upon the experience. Also, the other aspects contributed in achieving high extent. The missing feedback did not negatively affect the extent of reflection, however, could have put more emphasis on important findings. | **+** The reflection support contributed positively to the extent of reflection. Mainly the asking of open questions allowed participants to critically reflect upon the experience. The missing feedback did not negatively affect the extent of reflection, however, could have put more emphasis on important findings. |
| **Ability** | *Reflection experience* | **-** Only one of the project members had a gate review before. | **-** Only one of the project members had a gate review before. The other two are inexperienced | - Both project members have limited gate review experience. One of them attended one gate review before, the other twice before | - Both project members have limited gate review experience. One of them attended one gate review before, the other twice before | + All participants have more than 2 years experiences with thermometersessies, which are from a dialogue perspective similar, but miss the gate mechanism. On average participants have appropriately experience with 10 thermometersessies and some gate reviews. | + All participants have more than 2 years experiences with thermometersessies, which are from a dialogue perspective similar, but miss the gate mechanism. On average participants have appropriately experience with 10 thermometersessies and some gate reviews. |
| | | **N/a** The effect due to the lack of experience on the extent of reflection is unclear. | N/a The effect due to the lack of experience on the extent of reflection is unclear. | N/a The effect due to the lack of experience on the extent of reflection is unclear. | N/a The effect due to the lack of experience on the extent of reflection is unclear. | N/a The high experience might have contributed to better and more critical reflection, however, this is not clear. | N/a The high experience might have contributed to better and more critical reflection, however, this is not clear. |
| | *Communication* | **-** Communications were clear. However, the facilitators are predominant during the dialogue | **0** Communications were clear, however clearly two fronts occurred, even though participants sat mixed. So limited discussion happened between project members | **0** Communications were clear, and examples were used to illustrate as well as drawings to elaborate certain reflection cycles. Nevertheless, clearly two fronts occurred, even though | - The facilitators were distracted from the conversation by focussing on looking into project documentation, which resulted multiple pauses of | + The gate review was held online via MS Teams. Everyone could be heard clearly and the person who spoke was visible to the other participants. There was not | 0 The gate review was held online via MS Teams. Everyone could be heard clearly and the person who spoke was visible to the other participants. |

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| | | | | participants sat mixed. So limited discussion happened between project members | 10 seconds within the reflection and poor flow in the dialogue. Other communications were clear. | only dialogue between the project team and facilitators, but also between project members. When one was more knowledgeable, they would contribute to the dialogue. Even the project team questioned each other's assumptions. | Communication were clear, examples were used, and everyone seemed to have understand things clearly. Nevertheless, there was limited dialogue between the project members, only providing some additional information, but not questioning each other values. |
| | | **-** Due to the predominant position of the facilitators the reflection from the project team perspective is negatively affected as they did not have the room to speak. | **N/a** the effect of the communications on the extent of reflection is unclear. | **N/a** the effect of the communications on the extent of reflection is unclear. | - the distraction by the project document negatively affected the flow of the dialogue, and thus also did not exploit the potential of the reflection. | + The mutual dialogue, mainly between project members provided more perspectives on the experiences, and thus contributed in achieving a higher extent of reflection. | 0 The communication does not have a noteworthy effect on the extent of reflection. |
| | *Openness mistakes* | **+** Project members are open about their mistakes as they clearly indicate if they made mistakes | **-** Project members acknowledged that the gate review had an open ambiance. Yet, one of the members hold back during the discussion awaiting implicit approval of the project leader to elaborate the problem. Also, the member mentioned that 5% of the topics were sugar-coated. | 0 The project members did not explicitly mention their own mistakes, yet they stated very thing was transparently shared with the facilitators. | 0 The project members did not explicitly mention their own mistakes, yet they stated very thing was transparently shared with the facilitators. | 0 The project members did not explicitly mention their own mistakes, yet they stated very thing was transparently shared with the facilitators. | 0 The project members did not explicitly mention their own mistakes, yet they stated very thing was transparently shared with the facilitators and the facilitators also perceived that the participants shared their experiences honestly. |
| | | **+** The openness about mistakes resulted in higher extent of reflection, more reflection stages are covered, and higher intensities are achieved. | **0** the extent of reflection is not affected by the low extent of openness about mistakes. However, the reflection can be less genuine, and thus be of less value. | 0 The reflection was not influenced by the openness about the mistakes. | 0 The reflection was not influenced by the openness about the mistakes. | 0 The reflection was not influenced by the openness about the mistakes. | 0 The reflection was substantially influenced by the openness about the mistakes. |
| | *Abstract thinking* | **0** the project members had an average working level and education level. During the gate review no noticeable ability of abstract thinking was observed. | **0** the project members had an average working level and education level. During the gate review no noticeable ability of abstract thinking was observed. | **0** the project members had an average working level and education level. During the gate review no noticeable ability of abstract thinking was observed. | **0** the project members had an average working level and education level. During the gate review no noticeable ability of abstract thinking was observed. | **0** the project members had an average working level and education level. During the gate review no noticeable ability of abstract thinking was observed. | **0** the project members had an average working level and education level. During the gate review no noticeable ability of abstract thinking was observed. |
| | | **N/a** No clear effect of the average abstract thinking ability was identified. | **N/a** No clear effect of the average abstract thinking ability was identified. | **N/a** No clear effect of the average abstract thinking ability was identified. | **N/a** No clear effect of the average abstract thinking ability was identified. | **N/a** No clear effect of the average abstract thinking ability was identified. | **N/a** No clear effect of the average abstract thinking ability was identified. |
| | *Extrinsic motivation* | **N/a** besides that the gate review procedure is part of the workflow within the company no other extrinsic motivation is identified. | **N/a** Besides that the gate review procedure is part of the workflow within the company no other extrinsic motivation is identified. | **N/a** Besides that the gate review procedure is part of the workflow within the company no other extrinsic motivation is identified. | **N/a** Besides that the gate review procedure is part of the workflow within the company no other extrinsic motivation is identified. | **N/a** Besides that the gate review procedure is part of the workflow within the company no other extrinsic motivation is identified. | **N/a** Besides that the gate review procedure is part of the workflow within the company no other extrinsic motivation is identified. |
| | | **N/a** | **N/a** | **N/a** | **N/a** | **N/a** | **N/a** |
| **Motivation** | *Intrinsic motivation* | **+** project members regard the gate review as an opportunity to share challenges and problems with the facilitators in order to improve the project. | **0** Project members were curious about the gate review outcome. Only one member mentioned to want to improve on the project as result of the gate review | **0** The project members did not have an explicit intrinsic motivation to conduct and participate in the gate review. | **0** Project members were curious about the gate review outcome. Both also participated actively. One member mentioned to want to improve on the project as result of the gate review | **+** As the project team prepared the gate review in advance and predetermined the topics on which they want to reflect, the reflection becomes more relevant for them. | **+** As the project team prepared the gate review in advance and predetermined the topics on which they want to reflect, the reflection becomes more relevant for them. |
| | | **+** Due to the intrinsic motivation project members are eager to share their experiences and react | **0** the average intrinsic motivation of project members did not have a positive nor a negative influence on the extent of reflection. | **0** The intrinsic motivation of the project members did not affect the extent of reflection positively or negatively. | **0** the average intrinsic motivation of project members did not clearly have a positive nor a | **+** Consequently, the project members were more motivated to participate in the gate review and reflect upon | **+** Consequently, the project members were more motivated to participate in the gate review and reflect |

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| | positive to feedback, increasing the extent of reflection | | | negative influence on the extent of reflection. | the experiences to learn from them. Moreover, the project members can directly benefit from the reflection on experiences as it contributes to their work practices. | upon the experiences to learn from them. Moreover, the project members can directly benefit from the reflection on experiences as it contributes to their work practices. |
| | **0** Not all participants are familiar with each other, however stated to share information freely due to the inside company position of the facilitators. | **0** Not all participants are familiar with each other, however stated to share information freely due to the inside company position of the facilitators. | **0** Not all participants are familiar with each other, however stated to share information freely due to the inside company position of the facilitators. | **0** Not all participants are familiar with each other, however stated to share information freely due to the inside company position of the facilitators. | **0** All participants are familiar with each other. The facilitators are the heads of the project members and thus are more involved within the project and close with the project members. All have declared to share information freely. Yet, due to power relations the trust is scored as average. | **0** All participants are familiar with each other. The facilitators are the heads of the project members and thus are more involved within the project and close with the project members. All have declared to share information freely. Yet, due to power relations the trust is scored as average. |
| *Trust* | **N/a** no clear indication was found that trust affected the extent of reflection. However, it is likely that this had a neutral effect. | **N/a** no clear indication was found that trust affected the extent of reflection. However, it is likely that this had a neutral effect. | **N/a** no clear indication was found that trust affected the extent of reflection. However, it is likely that this had a neutral effect. | **N/a** no clear indication was found that trust affected the extent of reflection. However, it is likely that this had a neutral effect. | **0** The effect of the average trust is neutral. The facilitators have due to their role in the project already some information about the project, and thus developing shared understanding about the experience can be achieved without much discussion. Yet, it could also be a limitation as it is hard for the facilitators to be open minded during the reflection due to their involvement in the project. | 0 The effect of the average trust is neutral. The facilitators have due to their role in the project already some information about the project, and thus developing shared understanding about the experience can be achieved without much discussion. Yet, it could also be a limitation as it is hard for the facilitators to be open minded during the reflection due to their involvement in the project. |
| *Learning attitude* | **+** project members experience the feedback and advices as positive, and actively participated. | **+** Two project members had an explicit learning attitude. They actively participated, questioned assumptions and mentioned what could be improved | **-** One project member lacked some learning attitudes as he perceived conducting the gate review less relevant for a project that performs well (as in the current case) | **0** The project members actively participated nevertheless, did not show particular openness to feedback and suggestions. | **+** Two project members clearly stated lessons learned for the project or organisation (e.g. reflection cycle 5, 8, 9 and 11) characterizing a high learning attitude. | 0 The project members actively participated and wanted to some extent to improve on the project. Nevertheless, they were not very critical on own work and did not plan for action much. |
| | **+** the high learning attitude mainly increased the willingness to determine causes and effect, propose solutions and enable convergence on the reflection outcome. | **+** Consequently, four reflection cycles benefitted from the learning attituded and achieved a higher extent of reflection | **-** Consequently, learning was not valued as a priority. Nonetheless, the actual effect on the extent of reflection is hard to determine. | **0** The extent of reflection was not affected notably. | **+** Consequently, the reflection cycles achieved mainly higher intensities and sometimes more achieved reflection stages. | 0 The learning attitude did not noticeably affect the extent of reflection. |