BEYOND DOCUMENTATION

Lessons Learned as Socio-Technical Systems
in Construction Client Organisations

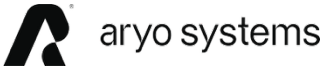
Student Name	Capelli Mattia
Student Number	6082823
Chair	Dr. Paul W. Chan
First Supervisor	Dr. Martijn Leijten
Company Supervisor	Ir. Mariya Ivanova
Defended on	03.10.2025
Study	MSc Construction Management and Engineering

For the purpose of obtaining the degree of Master of Science at the Delft University of Technology,

The work was made at:

Faculty of Civil Engineering & Geosciences (CEG)
Faculty of Architecture & the Built Environment (ABE)
Faculty of Technology, Policy & Management (TPM)
Delft University of Technology

In collaboration with:



Smart Software & Expert Consultancy
Aryo Systems B.V.

Dedications

This thesis marks the conclusion of my Master's in Construction Management and Engineering at the Faculty of Civil Engineering and Geosciences at Delft University of Technology. It represents not only the final step in my studies but also an important milestone toward the career I aspire to build in project management within the construction industry. I hope that, one day, I can contribute to the realisation of projects that leave a lasting impact.

This journey would not have been possible without the support and guidance of my supervisors. I am deeply grateful to Dr. Paul W. Chan, who, with only a few meetings, was able to understand me and push me to work on my weaknesses, helping me develop into a more complete professional. I also thank Dr. Martijn Leijten, whose methodological approach and engineering mindset taught me to structure my work and sharpen my critical sense. Finally, I extend my gratitude to Ir. Mariya Ivanova from Aryo Systems B.V., for her continuous support throughout the process. Her ability to simplify my overly complex thoughts and create a stimulating working environment at Aryo made completing this thesis both possible and rewarding.

Beyond academics, I owe everything to my parents. They have been my ultimate support in every situation: whether serious or trivial, professional or personal. Their encouragement and trust have been fundamental in launching my career journey.

I am also grateful to my lifelong friends, scattered across the world yet always present. Despite distance and busy schedules, they never fail to make time to share life's moments, visit each other, and remind me of the value of genuine friendship. To my new friends, I am equally thankful for bringing diversity, openness, and joy into this period of my life. You have made this journey truly memorable. A special word of gratitude goes to my girlfriend, who has shared with me the day-to-day challenges and joys, making this experience even more meaningful.

Lastly, I want to recognise myself. For pursuing, persevering, and delivering.

Enjoy the read.

Capelli Mattia
Delft, October 2025

Abstract

Despite their recognised value, Lessons Learned (LL) in construction client organisations often remain fragmented and limited to documentation, with little effect on practice. These practices remain fragmented and lack methods for systematic evaluation and context-sensitive improvement. The study is structured around three interdependent domains – networks, coordinators, and systems – which provide the foundation for analysing LL as more than a documentation exercise. Guided by Structuration Theory, employed here to connect social and technical dimensions, the research draws on qualitative interviews with four Dutch infrastructure clients. The analysis leads to the development of a socio-technical framework that enables organisations to diagnose current practices and tailor strategies for improvement. By bridging formal procedures with informal dynamics, the framework helps transform LL into a living practice that enhances project outcomes and strengthens organisational learning.

Executive Summary

The construction industry continues to face persistent performance challenges. Cost overruns, schedule delays, and repeated mistakes remain widespread, despite decades of investment in project management tools and methods. Lessons Learned (LL) practices are often cited as a mechanism to address these inefficiencies by capturing and reusing project knowledge. Yet in practice, LL frequently fail to deliver tangible improvements. Too often, they are reduced to documentation exercises—completed at the end of projects, stored in databases, and rarely revisited.

For client organisations, this problem is particularly acute. As initiators and long-term stewards of projects, clients are responsible for translating organisational needs into project requirements and for ensuring continuity of knowledge across multiple initiatives. However, their role in LL has been underexplored, and their practices remain fragmented. Many rely on formal reporting procedures that lack behavioural follow-through, while others depend on informal exchanges that are not institutionalised. What is missing is a systematic way to evaluate existing practices and to design interventions that bridge both technical and social dimensions.

This thesis addresses this gap by asking:
"How can construction client organisations enhance lessons learned practices across different organisational contexts and develop strategies for their improvement?"

To answer this question, the study integrates a review of existing research with empirical insights from semi-structured interviews with senior professionals across four major Dutch infrastructure clients: Port of Rotterdam, TenneT, Rijkswaterstaat, and Porthos. These cases span public, private, and joint-venture forms of governance, offering variation in organisational context and maturity of LL practices.

The research is structured around three foundational domains—networks, coordinators, and systems—which provide the starting point for analysing LL beyond documentation. These domains derive from Structuration Theory's principle of the duality of structure, which views practices as simultaneously shaped by and reproducing social systems.
Building on this foundation, Structuration Theory informs the study along two parallel analytical paths. The first is a generic analysis, which uses the three modalities of signification, domination, and legitimation to examine how LL practices are enacted across the domains of networks, coordinators, and systems. This lens makes visible how meaning, resources, and norms support or undermine LL effectiveness.

The second is a context-sensitive analysis, which also employs the modalities but operationalises them through a five-step desire-path approach: formal mapping, informal mapping, interpretation, evaluation, and integration. This approach captures the dynamic relationship between agents and structures, enabling organisations to adapt LL strategies to their specific context.
Together, these three applications of Structuration Theory—first to establish domains, then to analyse practices, and finally to guide contextual tailoring—form the backbone of the research and underpin the development of the socio-technical framework.

The findings demonstrate that Lessons Learned practices in client organisations can be systematically interpreted and evaluated by linking three elements: (1) the practices as they are formally and informally enacted, (2) the way employees perceive the effectiveness of those practices, and (3) their relationship to a general guideline framework that captures the key socio-technical elements and the dynamics between them.

This perspective enables organisations not only to diagnose the current state of their LL practices but also to understand how those practices are experienced and legitimised within the organisation. When combined with the framework, this diagnostic process supports the design of tailored interventions that address both systemic structures and behavioural realities. In this way, the research provides a practical pathway for client organisations to move from evaluating lessons learned as static artefacts to improving them as dynamic, socially embedded practices.

The framework does not prescribe a universal solution. Instead, it provides a flexible diagnostic tool that organisations can adapt to their specific context. For instance, some may need to strengthen top-down systems of accountability, while others may benefit from investing in peer-to-peer networks or training programmes. The emphasis is on synchronising formal structures with behavioural enablers to ensure that LL become actionable rather than symbolic.

The study concludes that LL only deliver value when supported by sustained organisational commitment and when formal and informal practices are aligned. By adopting the proposed framework, client organisations can move beyond documentation to embed LL as a living practice. In doing so, they can reduce the recurrence of mistakes, improve project outcomes, and build long-term organisational capability.

Table of Contents

Table of Figures

Table of Tables

1 INTRODUCTION

In this chapter, the research gap is explained. Starting with the explanation of the focus to address the scope, followed by the Review of the Previous Studies to argue for the research gap. Finally, the chapter concludes with the articulation of the explained gap, ending with the formulation of the Main Research Question.

1.1 The Research Focus

The construction industry, despite being one of the largest contributors to the global economy, accounting for approximately 13% of the global GDP, continues to face persistent performance challenges. Reports such as McKinsey [Ribeirinho et al., 2020] and ABN AMRO [Van Heel et al., 2019] highlight widespread issues, including budget overruns, time delays, and low profit margins. Notably, 94% of large construction projects experience cost overruns, with nearly 76% exceeding timelines, and failure costs are estimated to range from 5% to 13% of the contracted sum in many organisations. These inefficiencies underscore the urgent need for structured learning mechanisms that can mitigate recurring errors and improve project performance.

In this context, Lessons Learned (LL) practices are increasingly recognised as tools for fostering knowledge continuity across projects, reducing repetition of mistakes, and enhancing strategic decision-making. Yet, despite their theoretical potential, LL practices are often inconsistently applied, treated as post-project formalities, or disconnected from actual behavioural change [Milton, 2010; Caldas et al., 2009]. This mismatch between the perceived value of LL and their operationalisation within organisations results in missed opportunities for long-term improvement.

This research focuses on LL practices within construction client organisations, a group frequently underrepresented in LL literature. While much attention is placed on contractors and project teams, clients are often responsible for initiating projects, translating organisational needs into requirements, and ensuring long-term asset utilisation [Ryd, 2014]. Moreover, they carry a central

responsibility for project knowledge transfer across multiple initiatives [Bakker et al., 2011]. However, in practice, clients often lack the internal structures, incentives, or behavioural enablers to systematically embed LL into their operations.

Given this backdrop, the present study seeks to investigate how LL practices can be enhanced by bridging their technical structure (the processes, tools, and stages) with the behavioural dimensions that either support or hinder their effectiveness. Through this lens, the study contributes to a more grounded and applicable understanding of how construction clients can build LL frameworks that are not only systematic but also socially sustainable and context-sensitive.

1.2 Review of the Previous Studies

1.2.1 Lessons Learned Practices

While the idea of learning from past experiences is well accepted in theory, LL practices in construction are often fragmented, inconsistent, or superficial. Yet the potential value of LL is considerable, particularly in terms of long-term knowledge retention and organisational competitiveness. Paranagamage et al. [2012] argue that LL provide a unique, non-replicable knowledge asset that enhances a firm's strategic positioning over time. However, few organisations take systematic steps to institutionalise and operationalise this potential.

The barriers to effective LL implementation are multiple. Shokri-Ghasabeh & Chileshe [2014] identify lack of time and resources as major obstacles, even in organisations with documented LL procedures. Moreover, while earlier studies saw lack of management support as a primary issue, recent findings show that managerial interest has increased, yet time constraints and resource limitations remain persistent. This suggests that although the cultural shift toward valuing LL is underway, it has not yet been translated into robust operational routines.

Caldas et al. [2009] provide further insights into the fragility of LL programs. Despite growing recognition of their importance, many programs fail to reach maturity or produce measurable value. Legal concerns, poor performance metrics, and a general inability to demonstrate cost-benefit outcomes contribute to their underperformance. Organisations often track the volume of lessons captured but fail to evaluate their effectiveness or practical application.

At the same time, LL are often misinterpreted as simple documentation tasks rather than as a process of organisational change. Milton [2010] notes that true lessons are "learned" only when they trigger behavioural change, whether at the individual or institutional level. This implies that effective LL must be embedded into formal systems, guided by clear processes, and supported by leadership and culture.

Paranagamage et al. [2012] also highlight how LL usage varies across project stages, suggesting that tools and practices must adapt over time. Static or overly generic LL systems often fail to meet these changing needs, further limiting their effectiveness. Lastly, Rowe & Sikes [2006] emphasise that both failures and successes contain valuable insights, but failure to reflect systematically on either leads to repeated mistakes or missed opportunities.

These studies collectively justify not only the relevance of LL in project-based contexts but also the need to study them as dynamic, institutionally embedded, and behaviourally complex processes. Despite their intuitive appeal, LL practices remain underdeveloped and unevenly integrated into project governance.

1.2.2 Cultural and Behavioural Obstacles

A key limitation in the past studies is the insufficient treatment of LL as socio-technical processes—that is, processes that involve not only systems and tools but also human behaviour, culture, and interaction. Several studies have identified the social and cultural dimensions of LL, but these are often treated as peripheral or secondary to process design.

Almeida & Soares [2014] highlight the role of socialisation in LL, showing that projects can generate new knowledge through human interactions that transcend organisational boundaries. Similarly, Duffield & Whitty, [2014] argue that alignment between people and system elements is a key success factor for LL. Where people and culture are not aligned, LL initiatives are likely to fail, regardless of the technical sophistication of the tools in place.

Cultural barriers also emerge as recurrent themes. Eken et al., [2020] point to internal competition, reluctance to seek help, and blame cultures as common obstacles. These behavioural dynamics create environments in which employees are hesitant to report mistakes or share insights. Milton [2010] adds that unless LL are embedded into governance structures and reinforced through storytelling, incentives, or leadership modelling, they risk remaining superficial or being forgotten entirely.

Maqsood, [2006] adds another layer, emphasising the variation in individual learning capabilities and styles. Even when LL processes are well-designed, they must still account for the way individuals acquire, interpret, and apply knowledge. This makes LL deeply human-centred processes, affected by motivation, cognition, and trust.

In summary, although behavioural and cultural dimensions are widely acknowledged in LL literature, they are often treated as background conditions rather than central components. The lack of integration between technical process models and these human factors leaves a significant conceptual and practical gap, one that this thesis aims to address.

1.2.3 The Role of Client Organisations

In the construction industry, the importance of the client's role in enabling knowledge transfer and project learning is increasingly acknowledged. Traditionally, project knowledge has been perceived as the responsibility of the project team itself. However, recent research highlights a shift in this perception. Bakker et al. [2011] argue that the responsibility for project knowledge transfer lies primarily with the permanent organisation – that is, the client - rather than with the temporary project team. This challenges conventional assumptions and places greater emphasis on the capacity and commitment of client organisations in capturing and reusing Lessons Learned.

This perspective is reinforced by Ryd [2014], who defines construction clients not only as initiators and financiers of projects but also as actors who translate organisational needs into technical requirements and utilise built assets for long-term service delivery. Nevertheless, clients often lack the internal capacity or institutional power to influence outcomes effectively. Their success is hindered by split incentives, fragmented resources, and limited access to knowledge, particularly in complex multi-actor environments. This reinforces the idea that LL processes should not be designed solely from a contractor's or project team's viewpoint but must actively consider the client as a central, though underprepared, stakeholder.

In addition, the size and maturity of client organisations appear to influence their LL capabilities. Shokri-Ghasabeh & Chileshe [2014] show that larger contractors tend to be more aware of LL documentation practices and engage more consistently in LL activities. By analogy, this suggests that institutional capacity and organisational maturity—more typical of larger clients—are enablers of effective LL. Smaller clients, by contrast, may lack the systems, awareness, or resources to fully engage in such processes.

Together, these studies highlight that clients are not only relevant but often underutilised actors in project learning, and that their structural characteristics and internal capacity shape the success of LL practices. This justifies a focus on LL within client organisations as an important and still insufficiently explored research domain.

1.2.4 Conclusions

The reviewed literature makes a strong case for the importance of Lessons Learned (LL) in construction projects and, increasingly, for the role of client organisations in this process. LL are widely recognised as valuable, yet their implementation remains fragmented, constrained by time, resources, and organisational culture.

A recurring insight is that LL are not merely technical procedures of documentation or timing, but socio-technical processes that involve culture, behaviour, and interaction. However, most existing studies emphasise one side of this spectrum, leaving the interconnections between technical and behavioural aspects underexplored.

This review therefore highlights the relevance of LL in client organisations while also pointing to their conceptual and practical fragmentation. The next section builds on this by comparing the focus of existing studies and articulating the research gap that this thesis addresses.

1.3 Articulating the Gap: MRQ

The review of previous studies presented in Section 1.2 provides valuable insights into different aspects of Lessons Learned (LL) practices in construction. Individual contributions address specific dimensions such as context [Bakker et al., 2011; Ryd, 2014], behavioural aspects [Milton, 2010; Eken et al., 2020], technical processes [Caldas et al., 2009], or the role of networks and dissemination [Rowe & Sikes, 2006; Almeida & Soares, 2014]. Some studies also combine elements—for example, linking behavioural and technical aspects [Maqsood, 2006; Shokri-Ghasabeh & Chileshe, 2014]—yet these remain partial and isolated.

A comparative overview of these contributions is provided in Table 1. As the table shows, the existing literature covers relevant areas but does so in a fragmented manner. While certain studies focus on contextual conditions, others concentrate on technical or behavioural challenges. What is missing, however, is an integrated overview that brings these aspects together. More

importantly, no study offers a systematic way to evaluate LL practices or to translate such evaluation into tailored interventions. This limitation is particularly acute in the case of client organisations, whose role in project learning is increasingly acknowledged but rarely addressed through comprehensive frameworks.

Study	1.	2.	3.	4.	5.	6.
Paranagamage et al. [2012]	X					
Shokri-Ghasabeh & Chileshe [2014]	X		X			
Caldas et al. [2009]	X	X				
Milton [2010]				X		
Rowe & Sikes [2006]			X			
Almeida & Soares [2014]		X		X		
Duffield & Whitty [2014]				X		X
Eken et al. [2020]	X		X			
Maqsood [2006]	X	X	X	X		
Bakker et al. [2011]	X					
Ryd [2014]	X					

Tab. 1 Studies Area Comparison [Author]

Legenda	Area
1.	Context
2.	Behavioural Aspect
3.	Technical Aspect
4.	Overview
5.	Evaluation / Diagnosis
6.	Intervention / Implementation

Tab. 2 Area Legenda [Author]

This absence highlights the core research gap: although LL practices are well studied in theory, the literature lacks approaches that (1) integrate technical and behavioural dimensions, (2) provide an evaluative lens for diagnosing organisational practices, and (3) support context-sensitive strategies for improvement in client organisations.

In response, this thesis aims to develop an approach that enables construction client organisations to diagnose and improve their Lessons Learned practices by bridging technical processes with behavioural dimensions.

The central research question guiding this study is therefore:

"How can construction client organisations enhance lessons learned practices across different organisational contexts and develop strategies for their improvement?"

2 RESEARCH SET-UP

In this chapter, the set-up of the research is explained. Starting with the explanation of the Objectives, how these end up translating into the Research Questions, and finally, how these elements link together through a designated research process. Finally, the set-up of the outline of the research is explained, following the model of Chan [2020].

2.1 Research Objectives

This study aims to develop a framework that supports client organisations in effectively implementing LL practices while accounting for both behavioural and technical challenges. Unlike previous studies, which often treat LL as a one-size-fits-all solution, this research seeks to tailor LL strategies to the practical conditions faced by client organisations in the construction sector.

The first step of this research is to build a comprehensive understanding of how lessons learned (LL) practices are currently positioned within the construction industry. This involves looking not only at the formal processes that structure these practices, but also at the behavioural dynamics that determine whether knowledge is effectively shared and applied.
On this foundation, the research turns its focus to construction client organisations, examining how LL practices are actually carried out in those settings. This includes exploring the ways these are organised and supported, as well as how they are experienced and interpreted by those directly involved.
A further layer of inquiry considers the extent to which LL practices vary across different types of client organisations. Since organisational structures, cultures, and capacities can differ widely, this stage aims to capture the influence of these contextual factors on how practices are shaped and embedded.
The final step is forward-looking: drawing from the empirical insights, the study develops a framework that translates these findings into practical strategies. The ambition is to propose approaches that move beyond generic solutions and instead offer tailored recommendations that respond to the realities of different client organisation types.

This translates into the objectives depicted in Figure 1 (Fig. 1) below.

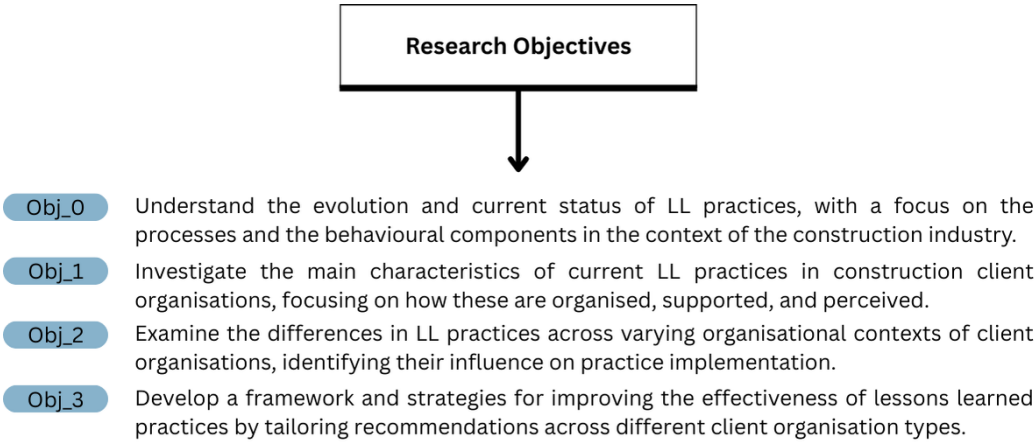


Fig. 1 Research Objectives [Author]

2.2 Research Questions

The Main Research Question (MRQ) for this study, as reported in Chapter 1.3 is the following:

> *"How can construction client organisations enhance lessons learned practices across different organisational contexts and develop strategies for their improvement?"*

To get to a throughout answer to this broad Main Research Question (MRQ), three questions (RQ) were formulated to guide the knowledge, data collection and analytical process. The research questions are depicted in Fig. 2 below.

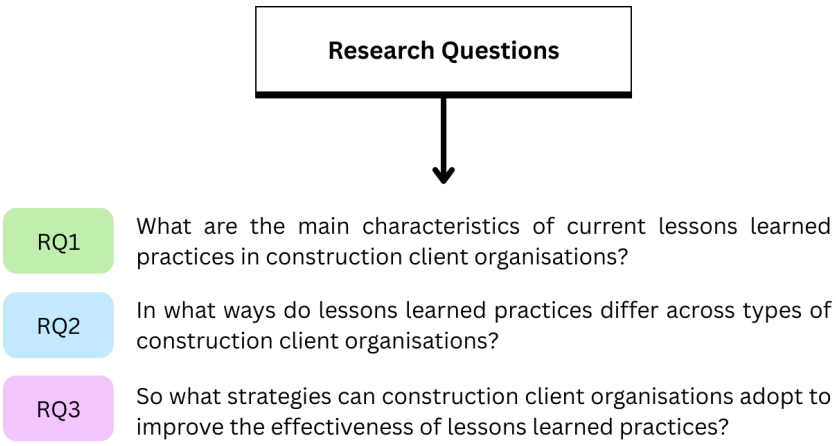


Fig. 2 Research Questions [Author]

2.3 Research Design and Outline

The research follows a structured design that connects the research objectives with the corresponding research questions (see the two preceding chapters), data collection methods, and analysis techniques. The figure below (Fig. 3) illustrates how these components are interlinked and contribute to the research process.

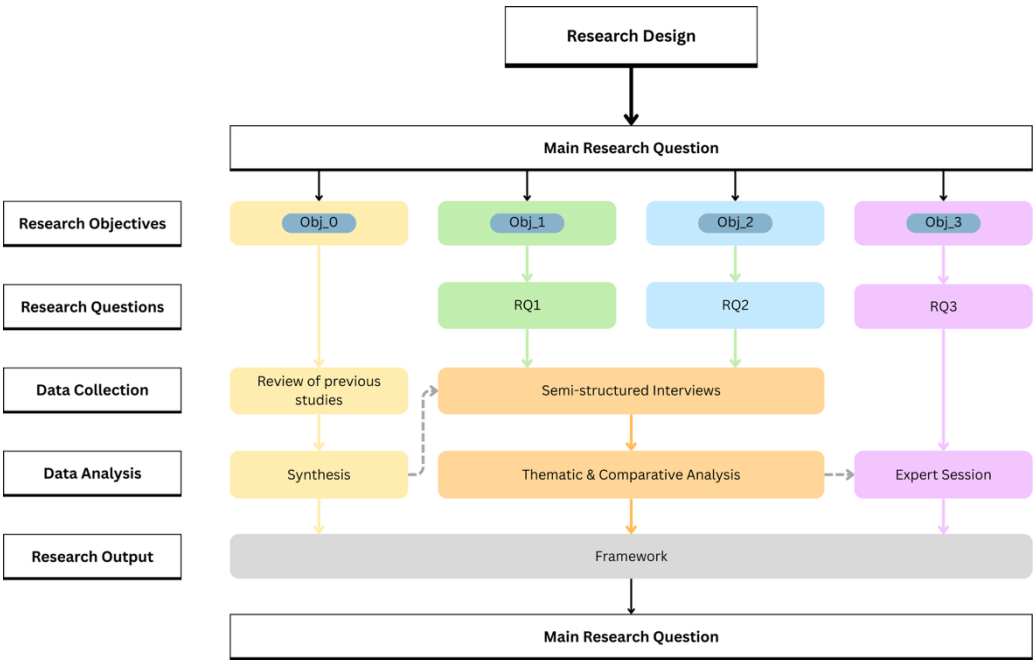


Fig. 3 Research Design [Author]

The first objective (Obj_0) is addressed through a literature review, which results in a synthesis of existing knowledge on lessons learned practices. While this part does not directly answer a research question, it provides the theoretical foundation and informs the design of the interview protocol used for the empirical study. The subsequent objectives (Obj_1 and Obj_2) are examined through interviews with professionals from construction client organisations. Obj_1, linked to RQ1, investigates the general characteristics of lessons learned practices across the industry, identifying recurring patterns and common approaches. Obj_2, linked to RQ2, focuses on how these practices differ between types of client organisations, capturing the role of organisational context in shaping their implementation. Taken together, these objectives provide both a broad overview and a more detailed perspective, ensuring that the analysis reflects both industry-wide tendencies and client-specific variations. The findings from this empirical work form the basis for the

analytical phase, which culminates in the development of a framework to answer RQ3 and achieve Obj_3. This framework integrates the insights from the previous stages and is refined through a validation process, ensuring both academic robustness and practical relevance.

When all the research questions are properly addressed, then the answer to the Main Research Question is given. The contribution is schematised in Figure 4 (Fig. 4) below.

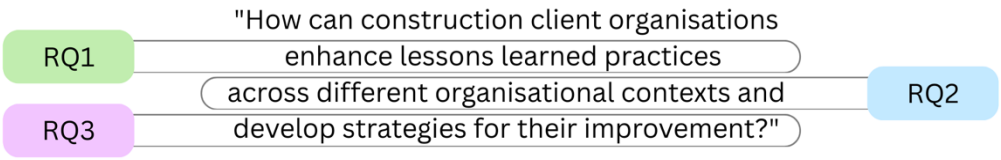


Fig. 4 Contribution Research Questions [Author]

Now that the design structure of the research is established, the outline is discussed. The research follows the structure approach brought on by [Chan, 2020] of the hourglass. It is composed of 4 parts, in order: a Front-End (with the introduction and the review of the previous studies); the Theory & Method (where the theoretical background is addressed and the methodology explained); the Results (the findings are reported); and the Back-End (with the discussion and the conclusion). In Figure 5 (Fig. 5) below, it is depicted how this scheme is adopted in this research.

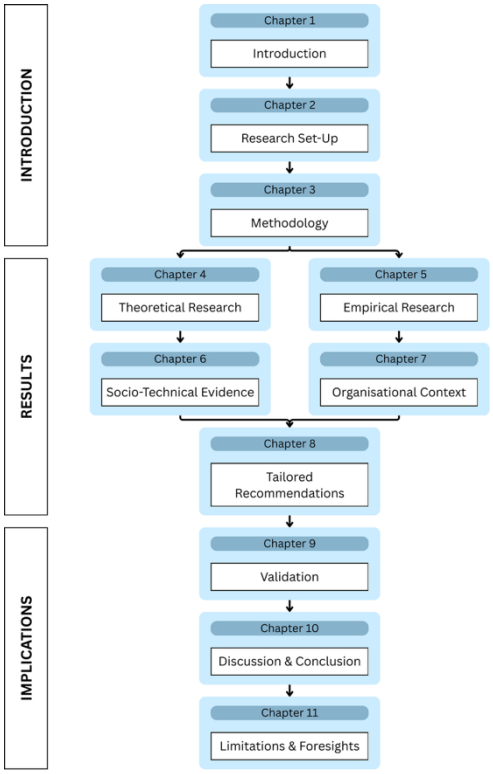


Fig. 5 Research Outline [Author]

3 METHODOLOGY

This chapter outlines both the methodology and the specific methods used in this research. Methodology explains why the study was designed in a particular way, while methods describe what was done in practice. The overall research design follows a qualitative strategy aligned with the socio-technical nature of Lessons Learned (LL) practices, reflecting the ambition to understand not only technical processes but also the behavioural and cultural dynamics within client organisations.

3.1 Methodology

The choice for a qualitative, socio-technical design is guided by the exploratory nature of the research question: How can construction client organisations enhance Lessons Learned practices across different organisational contexts and develop strategies for their improvement?

Four methodological considerations underpin this choice:

- Qualitative orientation. LL practices are context-dependent and shaped by cultural, behavioural, and procedural dynamics. A qualitative design enables capturing these dynamics in depth, focusing on meanings, tensions, and relationships rather than quantifiable measures.
- Exploratory characteristics. The study goes beyond description by exploring possible ways of evaluating and intervening in context-specific LL practices. This exploratory dimension reflects the objective of identifying both diagnostic and improvement-oriented strategies.
- Socio-technical perspective. Effective LL practices emerge from the interaction of technical procedures and social environments. The study therefore adopts an integrated lens, drawing on Structuration Theory, to examine how these elements interplay.
- Multi-layered analysis and validation. To move beyond isolated observations, the research combines theoretical and empirical insights through layered analysis and subsequently validates the findings with independent experts to ensure robustness and practical relevance.

3.2 Methods

3.2.1 Data Collection

Data collection was carried out in two phases: theoretical research and empirical research.

Theoretical Research (Literature Review)

A structured literature review was conducted to establish the state of the art. Academic databases such as Scopus, Web of Science, and Google Scholar were consulted. The review served three purposes:

1. To clarify definitions, processes, and procedural characteristics of LL practices.
2. To examine behavioural and cultural factors that influence the success or failure of LL initiatives.
3. To identify theoretical underpinnings and frameworks relevant to the socio-technical approach of this thesis.

These strands provided the conceptual foundation for later analysis, highlighted gaps, and informed the empirical research design.

Empirical Research (Semi-Structured Interviews)

To capture how LL practices manifest in practice, qualitative data were collected through semi-structured interviews. The target group consisted of professionals in Dutch construction client organisations, actively involved in governance, knowledge management, or oversight roles. Participants were recruited through professional networks and with support from the hosting company.

The interview protocol (see Appendix 1) was built directly on the synthesis of the theoretical research and the research objectives. Themes included LL processes, behavioural and cultural dynamics, challenges, and opportunities for improvement. Interviews lasted 45–60 minutes, were audio-recorded with informed consent, and transcribed verbatim.

3.2.2 Data Analysis

The analysis process unfolded in three complementary steps.

Synthesis of Theoretical and Empirical Findings

Insights from literature and interviews were summarised in a structured table using a consistent format, enabling direct comparison between theory and practice. This systematic synthesis clarified overlaps and divergences and created a bridge between conceptual and empirical knowledge. For Obj_1 (RQ1), the synthesis specifically mapped the current characteristics of LL practices.

Inductive Coding (Thematic Analysis of Interviews)

An inductive approach to qualitative coding was adopted, allowing themes to emerge directly from the data without imposing a pre-existing structure. The process, conducted in Atlas.ti, involved:

1. Full transcription of interviews.
2. Open coding to identify meaningful segments.
3. Axial coding to group codes into themes.
4. Selective coding to align findings with the research questions.

A codebook was iteratively developed to ensure transparency and consistency (see Chapter 5.2). Emphasis was placed on capturing tensions and interactions reflecting the interplay between technical LL processes and social environments.

Layered Analytical Approach

The coded and synthesised data were examined through three layers of analysis:

1. Thematic Analysis (Obj_1 / RQ1) – to describe the general characteristics of LL practices across client organisations.
2. Comparative Analysis (Obj_2 / RQ2) – to identify differences and contextual influences between organisation types.
3. Integrated Analysis (Obj_3 / RQ3) – to combine theoretical and empirical insights. In this stage, theoretical frameworks from the literature were used to interpret findings and generate the structuration outputs that underpin the framework presented later in Chapter 6.

This layered approach ensured systematic attention to each research objective while also enabling integration into a coherent socio-technical perspective.

3.2.3 Validation

To ensure reliability, completeness, and practical relevance, the framework and recommendations developed from the analysis were subjected to expert validation.

- Participants – Four professionals were selected, each with extensive experience in client-side project delivery and LL implementation, and independent from earlier stages of this thesis.
- Procedure – Experts attended a 60-minute presentation covering the research aims, methodology, findings, and the resulting framework and recommendations. This ensured a common understanding before evaluation.
- Instrument – A structured online questionnaire captured expert assessments across three dimensions:
  - Completeness: whether all relevant influencing factors were captured.
  - Effectiveness: whether the framework supported understanding of LL processes and challenges.
  - Feasibility / Applicability: whether it could realistically be applied in client organisations.

The validation confirmed the conceptual soundness and practical usefulness of the framework and recommendations. While qualitative in nature, the process provided independent critique that helped refine the outputs and strengthen their grounding.

4 THEORETICAL RESEARCH

In this chapter, the main theoretical constructs that guide this research is outlined. It provides essential background on concepts such as organisational learning, knowledge management, and the structuration of behavioural change within project environments. Theories and models discussed here underpin the analytical lens used to assess current practices and design an improved Lessons Learned framework.

4.1 Theoretical Background

4.1.1 Lessons Learned

Lessons Learned (LL) practices are situated within the broader domain of knowledge management and knowledge transfer. This section reviews the literature on LL by moving from general foundations toward more specific operational aspects. It begins with the link between LL and knowledge management and learning processes. It then examines how LL can be embedded into organisations to ensure they create value beyond symbolic compliance. Building on this, LL are framed as a process with distinct phases, which provides a structure to understand their dynamics. Finally, the role of technology and tools as enablers and barriers to LL practices is discussed. Together, these perspectives form the conceptual basis for analysing LL in construction client organisations.

Knowledge Management and Learning

The study of Lessons Learned (LL) practices is fundamentally rooted in the broader domain of knowledge management (KM) and knowledge transfer (KT). In project-based environments, the transfer of experiential knowledge across project boundaries is difficult due to the temporary, fragmented nature of teams Bresnen et al. [2005]. Within such settings, KM cannot be reduced to systems or tools alone, it must encompass organisational culture, routines, and the informal social interactions that enable individuals to interpret and act upon past experiences [Dutton et al., 2014].

Some research emphasises the conceptual vagueness surrounding LL terminology, noting that the lack of clear definitions hinders both implementation and comparison across studies [Jugdev, 2012; Dutton et al., 2014]. To counter this, Schindler & Eppler [2003] define lessons learned as "validated knowledge derived from experience that deserves to be learned and should be used for future action." This framing captures both the reflective and action-oriented dimensions of LL.

Knowledge transfer, then, becomes a crucial process for organisational learning. Carrillo [2005] argue that effective LL requires not only the capture of data but also the transformation of raw experience into meaningful, contextualised knowledge. This transformation process is both technical (e.g., involving tools and repositories) and social (involving people, motivation, and trust).
Schindler & Eppler [2003] underline the dual goal that projects should have: on one side the delivery of specific project outputs, on the other, projects should also "enrich the organisation's knowledge base". These positions learning as a core outcome, helping in making a shift in the team's mindset, and providing the justification for the efforts of alignment with the broader strategic development of a company.

Organisational Learning (OL) is complementary to KM [King, 2009]. The author depicts different ways to conceptualise the relationship between the two, but OL has its roots in what has been learned into it.
Within this view, understanding how knowledge is effectively captured and transferred becomes fundamental to any Lessons Learned (LL) practice.

A particularly insightful contribution comes from The Lessons Learned Handbook [Milton, 2010], which conceptualises LL approaches by combining two fundamental choices: the degree of formality in the system, and the emphasis on connecting people versus collecting lessons. This dual-axis framework results in four typologies of LL systems (Fig. 6); Each of these categories highlights different operational, cultural, and technological conditions for learning.

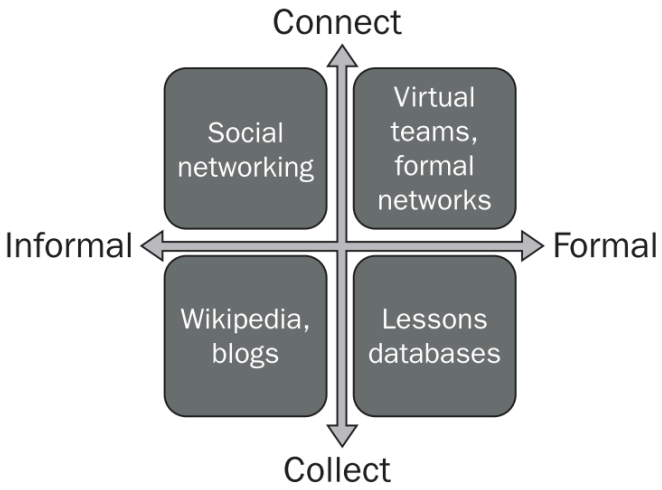


Fig. 6 4 Quadrants of Organisational Learning [Milton, 2010]

- Formal Collect Systems rely on structured processes, roles, and technologies to document and disseminate lessons. Often seen in sectors with high safety or financial risks (e.g., military, oil industry), these systems enable traceability, performance tracking, and accountability. Lessons are codified into databases, providing a centralised knowledge base. However, such systems can also introduce rigidity, with users reporting difficulties in contributing knowledge due to formality or perceived administrative burden.
- Informal Collect Systems, such as wikis or community-driven repositories, encourage voluntary and ad hoc contributions. These platforms lower the threshold for entry, allowing more diverse input, but often lack quality control and strategic alignment. Knowledge is easier to contribute, yet harder to verify or retrieve systematically, making them more suitable where creative or tacit knowledge is predominant.
- Formal Connect Systems foster knowledge exchange through structured human interactions, such as expert networks, knowledge brokers, or managed communities of practice. Rather than storing lessons, these systems facilitate access to the right expertise at the right time through purposeful networking. They are especially useful in dynamic or complex environments where context-specific understanding is crucial.
- Informal Connect Systems, like social media platforms or informal communities, thrive on spontaneity and peer exchange. They support culture change and encourage open dialogue but struggle to ensure knowledge consistency or organisational memory.

This model illustrates that no single system is sufficient. A blended approach is often needed, where formal and informal, collect and connect strategies are

combined in ways tailored to the organisation's needs, context, and learning maturity. Importantly, the author stresses that while balance is key, clarity must be maintained; Parallel informal and formal systems that contradict each other can lead to confusion and undermine learning outcomes.
In client organisations, where lessons often need to be transferred across projects, actors, and disciplines, this framework is particularly relevant. It not only helps assess current LL practices but also identifies areas where cultural barriers, misalignment of expectations, or inadequate tool integration may compromise effectiveness.

Embedding Lessons Learned

While LL provide a strong conceptual basis for improving performance, their effectiveness depends on how well they are embedded into organisational practices. Without integration into governance structures and management routines, LL often remain symbolic rather than actionable.

The value proposition of Lessons Learned (LL) lies in their potential to improve project performance, reduce the repetition of mistakes, and support strategic decision-making. However, this potential is often undermined by inconsistent implementation and weak integration into project governance [Caldas et al., 2009; Eken et al., 2020; Milton, 2010].

A recurring theme in the literature is the importance of embedding LL practices into organisational structures to ensure they move beyond symbolic compliance and create actual value. Schindler & Eppler [2003] introduce the concept of institutionalisation, suggesting that LL must be embedded into the organisation's project management framework. Reframing LL as a strategic—not optional—activity is a necessary step to increase long-term organisational impact. A practical measure toward this integration is reported by Rowe & Sikes [2006], who stress the need for senior management commitment to ensure program success. Regular review of repository metrics, concrete implementation of best practices, and efforts to reduce recurring project issues are identified as key enabling actions.

Despite such recommendations, many organisations continue to adopt LL processes in a symbolic manner Fong & Yip [2006], using them primarily to meet compliance requirements rather than to develop cumulative knowledge. Milton [2010] highlights two persistent problems in this regard: a lack of follow-up—where lessons are captured but rarely retrieved—and a lack of accountability, as actions are often unassigned and therefore not executed. These weaknesses prevent LL from being operationalised and integrated meaningfully into organisational learning.

To address these issues, Milton [2010] draws a crucial distinction between "lesson identification" and "lesson learning." Unless lessons lead to tangible behavioural or process changes, actual learning has not taken place. Paranagamage et al. [2012] support this by arguing that LL only become a valuable organisational asset when they inform future decisions and actions. Carrillo et al. [2013] further stress that lessons must be actionable and context-rich to generate meaningful impact. Milton [2010] suggests that for LL to be effective, each lesson must be accompanied by a defined action, a responsible person, and a time frame for execution. Yet, he also notes that organisations have made progress in lesson capture, but the benefits remain unrealised due to limited incentives for staff to engage with and act on stored lessons.

The importance of operational follow-up and integration is also reflected in the idea of assigning dedicated roles. Schindler & Eppler [2003] propose the creation of a 'debriefer', a facilitator who is neutral and trained to conduct post-project debriefing sessions. Their role is critical to foster project learning, organise knowledge, and guide reflection. The study suggests that this individual should ideally be external to the organisation to maintain neutrality. However, this also introduces barriers, as external actors require access to sensitive project documentation, raising concerns about confidentiality and organisational trust.

Finally, Milton [2010] notes that the integration of LL into broader governance structures could be supported through the use of business reporting systems. This would allow not only lessons but also their associated actions to be tracked systematically, helping to close the loop between identification and implementation.

In summary, the literature reveals a shared understanding of LL's potential, but also widespread shortcomings in execution. Addressing these requires more structured LL processes, their clear integration into project governance, and stronger cultural and managerial support to ensure lessons are not just captured but actually learned.

Process Characteristics and Phases

To move beyond isolated observations, the literature also emphasises the need to conceptualise LL as a structured process. Establishing a processual view helps to distinguish between different stages of learning and highlights where breakdowns most often occur.

Among the frameworks available, Duffield & Whitty's [2014] model is particularly useful for this thesis. It not only frames LL as a socio-technical system, combining both people and processes, but also defines three distinct

phases: identification, dissemination, and implementation. This provides a clear structure for analysing how lessons are created, shared, and applied. This framework is therefore adopted here to organise the discussion of LL processes, with additional studies introduced at each phase to expand on its dynamics.

Duffield & Whitty [2014] propose a comprehensive model that frames LL as a systemic process consisting of three interconnected phases: Identification, Dissemination, and Implementation. This process orientation builds upon earlier work of Reason [2000,1997], which conceptualised the "Swiss cheese model of defences," where risk management is seen as the alignment of organisational defences (Fig. 7). The authors evolve this into their Syllk model. The first adaptation encompasses the switch from the alignment of organisational defence layers to the alignment of the various modes of social and cultural learning; Likewise, the holes in the so-called "elements", switch from being errors in systems and processes (which alignment would cause organisational accidents) to become facilitators of learning (Fig. 8). This is a fundamental change as it shows that in order to effectively apply (implement) a LL, there is the need of the alignment of these holes.

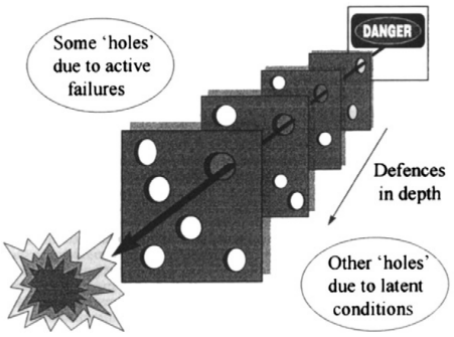


Fig. 7 Swiss Cheese Model [Reason, 1997]

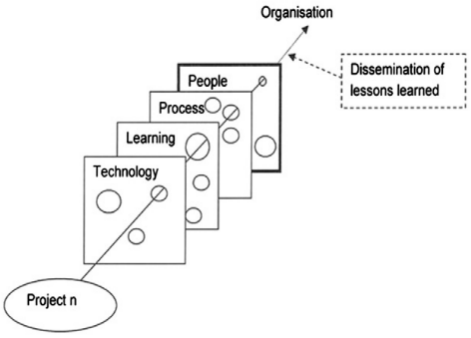


Fig. 8 Initial Syllk Model [Duffield & Whitty, 2014]

The Syllk model then further evolves into a more dynamic framework that maps LL processes onto 2 interrelated organisational structures: people (social, culture, learning), and systems (infrastructure, technology, process (Fig. 9).

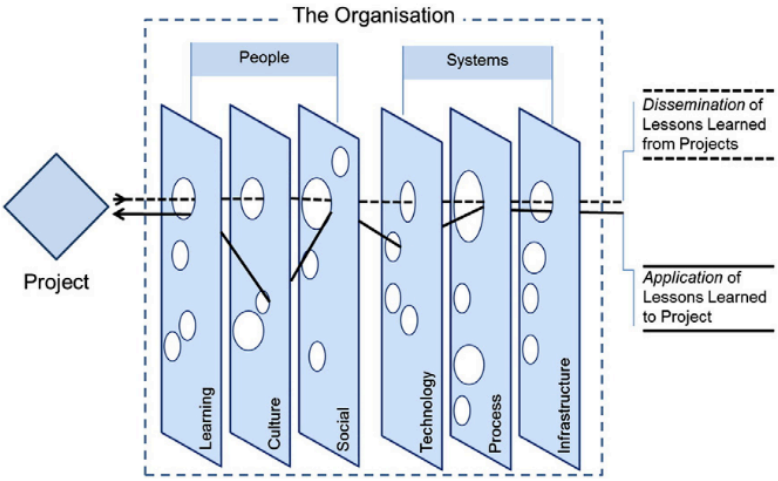


Fig. 9 The Syllk Model [Duffield & Whitty, 2014]

The Syllk model represents LL not as isolated events but as systemic flows of knowledge through these subsystems. The implication is that improving LL means aligning these domains, such as ensuring that technological tools (e.g., repositories) are supported by social practices (e.g., knowledge-sharing cultures) and learning incentives (e.g., leadership endorsement).

Identification

The identification phase covers the process leading up to the formal recognition and documentation of a lesson. This includes observing project experiences, reflecting on their outcomes, and recording them (typically in written or multimedia form) so that the knowledge becomes available for future use. This phase refers to the extraction of relevant experiences and insights. Duffield & Whitty [2014] caution against conflating data capture with learning, emphasising that lessons require reflection, validation, and contextual framing.

As mentioned before, this is the only phase that is recognised as being done in companies, but it is often confused with the whole life-cycle process of LL practices [Paranagamage et al., 2012; Duffield & Whitty, 2014].

Another common practice is to conduct the identification phase post-project (when the project is finished, at least the execution phase). Rowe & Sikes [2006] argue that it is not necessary to wait; It is actually more effective to keep identifying lessons at any point during the project. Although the frequency and time frames depend on the complexity of a project and are therefore not fixed, waiting until the end would contribute in missing key lessons. This is because the extended time of a project might lead to forgetting all detailed happenings, and because of the dynamic characteristic of construction projects, participating teams change.

Milton [2010] brings this information to the next level, by defining two primary triggers for lessons identification: reactive and proactive processes. Reactive identification happens in response to incidents, failures and successes, and it only takes place after something notable has occurred. Contrary, proactive identification is planned and continuous; The purpose of this type is to identify knowledge before it becomes critical. The study recommendation is that organisations should design LL processes that balance both learning events.

Dissemination

The dissemination phase begins once a documented lesson is shared beyond its original context. This involves actively transferring the recorded knowledge to other individuals or project teams who may benefit from it, thereby enabling organisational learning to move across project boundaries. This step transforms localised, project-specific insights into transferable knowledge by distributing it across individuals, teams, or departments. Yet, despite its crucial role in enabling organisational learning, dissemination is often treated as a passive or purely procedural step.

A valuable framework for understanding dissemination dynamics comes from the work of Duggan & Banwell [2004], who investigated effective information dissemination during a crisis. While the context of their study was the healthcare sector, their conclusions provide transferable insights applicable to LL practices. The authors identified three interdependent factors that significantly affect dissemination outcomes: (1) targeting information, (2) opinion leadership, and (3) willingness to accept new knowledge.

The first key component is the tailoring of information to the needs and characteristics of the audience. Duggan & Banwell [2004] emphasise that generic, undifferentiated dissemination strategies are less effective, especially in complex or heterogeneous environments. The failure to tailor information to each group's needs often created barriers to understanding and uptake.
This has clear parallels in construction project environments, where team members and clients may operate under different technical, cultural, and hierarchical assumptions. LL dissemination, therefore, should not rely solely on centralised databases or uniform documents but must take into account project roles, language fluency, and access to digital tools.

A second critical factor is the use of opinion leaders as facilitators of knowledge transfer. According to diffusion of innovation theory and social cognitive theory (both referenced in Duggan and Banwell's analysis), opinion leaders serve either as persuasive influencers or as behavioural role models. Their ability to "model" the adoption of new practices legitimises the lesson being shared and makes it more likely to be embraced by others. In construction client organisations, opinion leaders might include project

sponsors, senior engineers, or trusted team leads, individuals whose status and credibility can influence the perception and adoption of LL outputs. Importantly, Duggan & Banwell [2004] also caution against heterophilous communication (i.e., between dissimilar individuals), which can hinder trust and uptake. LL dissemination strategies should therefore seek to leverage homophilous channels of peer-to-peer communication where shared experiences and contexts reinforce credibility.

The third and perhaps most subtle factor is the recipient's willingness to engage with and adopt new knowledge. Drawing on the typology of information-seeking behaviours, the authors distinguish between "monitors" who actively seek information and "blunters" who avoid it, often due to cognitive overload, discomfort with the subject, or perceived irrelevance. The mistaken assumption that lack of inquiry equals satisfaction with existing information was found to be a major flaw in the crisis case. In LL practices, this insight suggests that dissemination efforts must account for behavioural receptiveness. Just sharing a document or uploading a lesson to a portal does not guarantee impact.

These concepts of dynamics involved in the dissemination of information are repeated in the context of LL by [Bakker et al., 2011]. The author argues that, based on its gathered data, a transfer is working properly only when "a high level of absorptive capacity is coupled with a high level of temporal and cognitive embeddedness of the relation between the project manager and the project owner". Despite this being pointed out in a specific role relationship, the underlying concept of communication and trust being at the basis of an effective knowledge transfer is acknowledged.

Implementation

The implementation phase refers to the application of previously documented and shared lessons within new project environments. This step involves translating lessons into actionable practices or decisions in a different project setting (often regarded as the most complex phase to execute effectively).
Implementation marks the transformation of a lesson into an actual change in process, behaviour, or strategy. According to Milton [2010], this is the only point at which "learning" truly occurs. Duffield & Whitty [2014] reinforce this by noting that implementation requires embedding lessons into existing organisational structures, through governance frameworks, management reviews, training, or revised protocols. Without a clear owner, action plan, and accountability mechanism, lessons risk remaining symbolic. Milton [2010] stresses further the concept of clear ownership: each action related to LL must have a responsible person named after it, not to be generalised to a department or a team, otherwise it would not be as efficient. Another method

for ensuring that LL follow up in the project is, as explained before, the integration of LL practices into project goals [Schindler & Eppler, 2003].

Some studies suggest that implementation is the most neglected phase in LL practice Eken et al., [2020]. This is often due to resource constraints, lack of follow-up, or weak feedback systems. Carrillo [2005] argues that organisations need to make LL part of decision-making rather than treat it as a separate activity. The integration of LL into project stage gates (discussed later in chapter 4.1.2) is one promising pathway to address this.

Supportive Technology and Tools

Finally, the literature also recognises that LL practices are rarely implemented without technological support. Tools and systems are often presented as solutions to facilitate capture, storage, and transfer. However, research consistently shows that technology alone is insufficient, and its effectiveness depends on how well it is aligned with social and cultural dimensions of learning.

While many organisations turn to technology to "solve" LL, research shows that tools alone are rarely sufficient. Almeida & Soares [2014] highlight several challenges with tech-based solutions, including poor usability, low adoption, and failure to integrate into day-to-day workflows. Similarly, Paranagamage et al. [2012] report that knowledge repositories often go unused because they are static, generic, or difficult to access.

Carrillo [2005] and Rowe & Sikes [2006] advocate for dynamic systems that are adaptable, searchable, and integrated into project routines. Push-notification systems, metadata indexing, and lessons embedded in risk or quality systems are more effective than standalone databases. However, as Eken et al. [2020] emphasise, even the most sophisticated tools will fail if the organisational culture does not support openness, reflection, and continuous learning.

4.1.2 Behavioural Aspects

While the previous section emphasised the structural and procedural dimensions of LL practices, this section highlights the behavioural and cultural aspects that shape their effectiveness.

In the context of construction projects, behavioural and cultural dynamics critically shape the effectiveness of Lessons Learned (LL) and broader knowledge management (KM) efforts. Although many firms have implemented LL tools and platforms, the success of such systems depends

less on their technical sophistication and more on their human and organisational context.

A recurring barrier to knowledge sharing is the presence of blame cultures, internal competition, and knowledge-hoarding behaviours. Carrillo et al. [2013] observe that employees often avoid sharing lessons, particularly when doing so might expose failures or undermine their authority. In environments where "knowledge is power," project managers may be reluctant to transfer critical insights. Similarly, Eken et al. [2020] identify human and cultural limitations such as reluctance to seek external advice and the fear of negative consequences as key reasons why LL practices are underutilised in construction organisations. These insights resonate with Bresnen et al. [2005] who show that new knowledge, particularly when introduced externally, often clashes with established project routines and ingrained power structures. The degree of disruption determines the required change strategy: where knowledge challenges existing practices or hierarchies, participation and negotiation are needed; where changes are less visible, employee engagement and alignment with strategic goals become essential. Together, these studies underscore that behavioural barriers can manifest in different but related forms, often undermining LL initiatives despite the presence of formal systems.

This perspective is deepened by Szulanski [1996] concept of "knowledge stickiness", defined as the difficulty of transferring best practices within an organisation. While earlier literature tended to stress motivational barriers, such as lack of incentives or resistance to change, Szulanski [1996] identifies deeper barriers: the absorptive capacity of recipients (their ability to understand and apply knowledge), causal ambiguity (difficulty in explaining why a practice works), and poor communication relationships. His work underscores that successful knowledge transfer requires strong interpersonal connections and deliberate support for learning capabilities across organisational units.

In practice, this stickiness is often compounded by structural constraints. In fact, nowledge sharing is also affected by contradictory managerial goals and ambiguous roles. Steiner [1998] highlights how project team members often navigate conflicting demands, such as the tension between appearing competent and admitting errors. This leads to learning avoidance or superficial engagement with LL practices, further inhibiting their institutionalisation.

If such behavioural barriers constrain LL, then cultural alignment and leadership support emerge as essential enablers. Duffield & Whitty [2014] argue that among the different elements of the systemic LL framework, the

people and culture factors are most likely to hinder success. When cultural values such as openness, trust, and reflection are not modelled by leadership, technical systems alone cannot compensate. This sentiment is echoed by Teräväinen & Junnonen [2019], which shows that even well-designed KM initiatives falter when cultural resistance persists. Transformational change in such settings requires leaders to not only endorse LL but to visibly practice and reward it in everyday project management.

As discussed earlier in the context of dissemination (Section 4.1.3), Duggan & Banwell [2004] offer a comprehensive model (presented in Chapter 3.1.3) which outlines the critical conditions for effective dissemination of lessons. They stress three interdependent elements: (1) the willingness of recipients to accept new knowledge, shaped by relevance, trust, and perceived threat; (2) the targeting of messages to specific audiences, rejecting one-size-fits-all approaches; and (3) the strategic use of opinion leaders, who can influence others and promote change. These insights reinforce that dissemination is not just a procedural step but is embedded in relationships and perceptions of authority.

The importance of participatory design and communication is also critical. Kim & Joh [2005] note that excluding staff from the design of LL systems and failing to demonstrate performance benefits often results in disinterest or resistance. Similarly, Barriers and Enablers of Effective KM shows that when employees perceive knowledge sharing as irrelevant to their roles, or worse, as a compliance exercise, they are unlikely to engage meaningfully.

In sum, behavioural aspects of LL and KM practices in construction reflect a complex interplay between identity, trust, power dynamics, and institutional norms. Overcoming these challenges demands a socio-technical strategy that goes beyond implementing platforms or checklists. It requires recognising LL as a process of negotiated meaning, embedded in relationships and shaped by culture. Effective LL practice cannot be mandated—it must be cultivated through leadership, participation, and continuous alignment between organisational values and project realities.

4.1.3 Synthesis

This section brings together the main insights from the theoretical background to give a clear overview of what is currently known about Lessons Learned (LL) practices in construction client organisations. It focuses on the three key phases of LL (identification, dissemination, and implementation) while distinguishing between the technical procedures and the behavioural or cultural factors that influence them. The synthesis is first presented in a basic table, followed by an extended version that highlights common patterns and

points of friction. This overview prepares the ground for the interview phase by clarifying where the literature aligns and where practical uncertainties remain.

The table below (Tab. 1) provides a synthesis of the key insights emerging from the literature review, structured according to the three main phases of Lessons Learned (LL) practices: identification, dissemination, and implementation. For each phase, two dimensions are distinguished: (1) the technical or procedural features of how the process is typically conducted, and (2) the behavioural and cultural aspects that shape how LL practices are enacted or resisted within organisations.

While technical systems are often in place, especially for documentation, behavioural factors frequently remain unaddressed, resulting in a gap between LL's theoretical potential and its practical execution.

LL Phase	Technical/Procedural Aspects	Behavioural/Cultural Issues
Identification	- Most frequently applied phase - Done post-project, often too late - Lacks proactivity - Emphasis on documentation, not reflection - Reactive rather than embedded	- Blame culture and fear of judgment discourage openness - Reluctance to admit mistakes - Trust issues inhibit open sharing
Dissemination	- Passive transfer (e.g., repositories) - Limited tailoring to users - Weak feedback mechanisms - Lack of use of opinion leaders - Transfer not adapted to audience or timing	- Engagement depends on trust and message relevance - Low absorptive capacity limits uptake - Peer credibility (homophily) is key for acceptance
Implementation	- Least implemented phase - Lessons rarely linked to action - No responsible actors assigned - Not tracked in governance or reporting systems - Poor follow-up after documentation	- Resistance to behavioural change - Power structures protect old routines - Ambiguity in roles and responsibilities reduces accountability

Tab. 3 Theoretical Status Quo of LL [Author]

To deepen the understanding of LL practices as socio-technical systems, the synthesis was expanded by analysing patterns across both dimensions and phases. Two new analytical layers were added:

- Common Aspects: These represent cross-cutting themes that consistently support or condition LL practices. When these are present—such as strong leadership, tailored communication, or accountability mechanisms—they function as enablers for effective LL.

- Frictional Aspects: These highlight points of misalignment or tension between the technical and behavioural dimensions. Friction arises when, for example, formal processes demand openness but organisational culture penalises mistakes, or when technology

platforms are available but fail to resonate with users' values or capacities.

Both common and frictional aspects are assessed along the horizontal axis (i.e., within each LL phase) and the vertical axis (i.e., across the technical or behavioural dimensions). This dual perspective helps clarify not only which factors are recurrently beneficial or problematic but also how socio-technical misalignments persist across the LL lifecycle. The results are reported in the table below (Tab. 2).

LL Phase	Technical/Procedural Aspects	Behavioural/Cultural Issues		
Identification	- Most frequently applied phase - Done post-project, often too late - Lacks proactivity - Emphasis on documentation, not reflection - Reactive rather than embedded	- Blame culture and fear of judgment discourage openness - Reluctance to admit mistakes - Trust issues inhibit open sharing	- Formal systems need informal support (trust) - Leadership enables both cultural safety and structured reflection	- High formalisation discourages honesty - Pressure to "perform" suppresses error reporting - Timely documentation clashes with reluctance to share issues early
Dissemination	- Passive transfer (e.g., repositories) - Limited tailoring to users - Weak feedback mechanisms - Lack of use of opinion leaders - Transfer not adapted to audience or timing	- Engagement depends on trust and message relevance - Low absorptive capacity limits uptake - Peer credibility (homophily) is key for acceptance	- Trust and relevance both needed for effective dissemination - Communication tailoring bridges technical and social	- One-size-fits-all formats are rejected socially - Tool-based dissemination is ignored due to overload or irrelevance
Implementation	- Least implemented phase - Lessons rarely linked to action - No responsible actors assigned - Not tracked in governance or reporting systems - Poor follow-up after documentation	- Resistance to behavioural change - Power structures protect old routines - Ambiguity in roles and responsibilities reduces accountability	- Accountability and ownership crucial across both sides - Leadership and norms must align with process enforcement	- Lessons remain symbolic when action is socially undermined - Cultural norms that resist change override formal prescriptions
	- All phases rely on structured processes to extract, distribute, and act on knowledge - Each phase suffers when process steps are siloed or not linked to governance - Success requires timing, ownership, and system integration	- All phases are shaped by trust, leadership, and organisational culture - Behavioural readiness (openness, capacity, motivation) is required across the lifecycle	**Common Aspects**	
	- Systems often operate in isolation from users' needs - Process rigidities (e.g. late identification, generic dissemination, no follow-up) clash with project dynamics	- Resistance to exposure undermines early-phase reflection - Power structures and blame culture actively block both transfer and implementation		**Frictional Aspects**

Tab. 4 Theoretical Common and Friction Aspects of LL [Author]

The synthesis highlights how Lessons Learned practices are shaped by the interaction between formal procedures and informal behavioural dynamics. While each phase shows recurring challenges and some shared enablers, there are also clear points of friction that limit effectiveness, especially where technical systems overlook cultural realities. These tensions reflect deeper organisational dynamics that will be further explored in the analysis phase through the lens of Structuration Theory.

4.2 Theoretical Underpinnings

To complement the literature on LL practices and their behavioural dynamics, this thesis also draws on theoretical frameworks that provide deeper explanatory power. These theories are not presented in isolation but serve as analytical lenses to bridge the socio-technical dimensions of Lessons Learned.

Three frameworks are particularly relevant. Structuration Theory offers a conceptual lens to examine how individual agency and organisational structures interact in shaping LL practices. Building directly on this theory, the

Desire Path approach provides a five-step analytical method to compare formal procedures with informal realities, thus offering a way to translate structuration into practice. Finally, the Stage-Gate Process addresses the procedural and managerial side of LL, offering a structured sequence of project phases and decision points where learning can be embedded systematically.

Taken together, these theoretical perspectives support the socio-technical ambition of the thesis: to understand LL not only as a process but also as a socially embedded practice shaped by people, culture, and context, and to provide practical tools for identifying, evaluating, and integrating those insights into organisational routines.

4.2.1 Structuration Theory

Anthony Giddens' structuration theory is a social theory that seeks to reconcile the dualism between human agency (the capacity of individuals to act) and social structure (the broader systems of rules and resources that constrain or enable those actions). Instead of treating structure and agency as independent or opposed, Giddens proposes a duality of structure, meaning they are interdependent, structure shapes actions, and actions in turn produce and reproduce structure [Dickey-Clark, 1987]. Structuration theory thus provides a framework to understand how everyday social practices are ordered across time and space without resorting to either an over-socialised view (where structure dominates and agents are merely "bearers" of structure) or an under-socialised view (where free agents act without constraint). It emphasises that social order is an ongoing, dynamic process: through their knowledgeable activities, people continually create and reshape the social systems in which they live.

Duality of Structure

A core principle is the duality of structure. Giddens defines structure as the medium and outcome of social action: "the structural properties of social systems are both the medium and the outcome of the practices that constitute those systems" [Dickey-Clark, 1987]. In other words, social structures are not external forces existing apart from human action; rather, structures are instantiated only when agents draw upon them in practice. At the same time, those recurrent practices reinforce or alter the structure. This reflexive feedback loop means that structure both constrains and enables action: it provides established routes for action (hence giving a sense of order and predictability), but those same routinised practices can be changed by agents, leading to structural evolution [Dickey-Clark, 1987]. Giddens stresses the recursive nature of social life, the repetition of similar practices over time,

grounded in what he calls practical consciousness (tacit, taken-for-granted knowledge of "how to go on" in social situations), which actors continuously employ [Bang, 1992]. Because structure is seen as memory traces or informational schema in the minds of actors and not a material entity, it exists virtually until enacted in concrete social interactions [Jones & Karsten, 2003]. This perspective moves beyond the traditional subject (agent) vs. object (society) split: "Social analysis must be founded neither in the experience of the individual agent alone, nor in the existence of any societal totality, but in the duality of structure". Through duality, structure is both an outcome of past actions and a resource for future action, capturing the mutually constitutive relationship between society and the individual.

Structure, System and Social Interaction

Giddens makes an important distinction between structure and system. In structuration theory, structure refers to the set of rules and resources (organised as properties of social systems) that exist as "virtual" orderings outside of time and space [Dickey-Clark, 1987]. These are the institutionalised practices, norms, and capabilities that agents carry in memory and know how to apply. Structure in this sense has no physical form; it is real only as memory traces and schemas that can be invoked by knowledgeable agents [Jones & Karsten, 2003]. By contrast, a social system (or system of interaction) is the pattern of social relations or regular practices reproduced by agents across time and space [Dickey-Clark, 1987]. Giddens defines social systems as "regularised relations of interdependence between individuals or groups, organised as recurrent social practices… systems of social interaction" [Dickey-Clark, 1987]. These are the observable, empirical social processes, the "situated doings of concrete subjects", which unfold in contexts and can be analysed as events in time and space. Simply put, structure is the underlying virtual pattern (the rules/resource schema), whereas system is the enacted pattern, the actual social activities and relations that occur and persist.
This separation clarifies that structure (as generative rules and resources) underlies but is distinct from the social system (the ongoing series of interactions). It also underscores how modality links the two: modalities are the conduits through which structural schemas are translated into concrete interactions, as discussed next.

Modalities

Modalities in structuration theory are the intermediate elements that connect the abstract structure with day-to-day social interaction. Giddens identifies three fundamental structural dimensions, each with its corresponding modality through which agents draw on structure in action [Loyal, 2003]. This can be visualised as a three-by-three framework of Structure, Modality,

Interaction, with each row representing a different dimension of structured social practice. The three dimensions (often called structural elements or institutional dimensions) are: signification, domination, and legitimation. Briefly, signification corresponds to meaning, domination to power, and legitimation to normative regulation. The modalities linking these to interaction are, respectively: interpretative schemes, facilities, and norms. And the aspects of interaction that correspond are: communicative meaning (for signification), exercise of power (for domination), and sanctioning of conduct (for legitimation) [Loyal, 2003]. Giddens first outlined this schema in Central Problems in Social Theory [1979], Figure 10 (Fig.10) below summarises the triad of structure–modality–interaction.

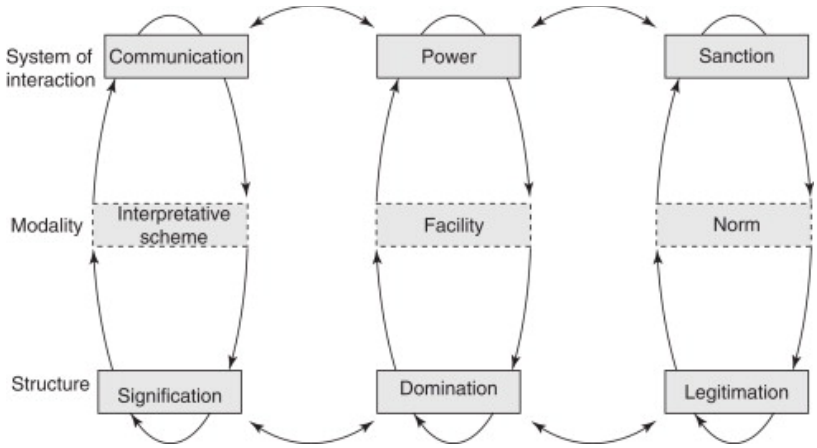


Fig. 10 Structuration Theory (adapted version)

In this framework, when agents engage in social action, they draw upon these modalities (the middle column) as the means to invoke structure, and in doing so, they reproduce (or sometimes alter) the corresponding structural properties (third row) in their system of interaction (first row). Each structural dimension can be explained as follows:

- Signification (Meaning): This dimension involves the production of meaning through interpretative schemas. An interpretative scheme is the modality that represents the stocks of knowledge, the cognitive frames, symbols, and language, that agents use to communicate and make sense of events [Dickey-Clark, 1987]. Structure of signification thus refers to the symbolic orders or semantic codes that inform how information is interpreted in a society. Through signification, actors communicate by drawing on shared understandings. For example, mutual knowledge of language or social cues provides interpretive frames so that when we see someone in a white coat in a hospital, we interpret them as a doctor – a meaning derived from the structure of signification [Jones & Karsten, 2003]. These interpretive rules are not static; they are sustained only through continual use in communication.

By using common interpretative schemes in interaction, individuals confirm and perpetuate the meanings (significations) that structure their social world [Loyal, 2003].

– Domination (Power): This dimension concerns the exercise of power through the mobilisation of resources, which Giddens calls facilities. Resources are the media through which power is exercised and can be of two types: authoritative resources (capacity to control or coordinate human beings) and allocative resources (control over material objects or assets). The structure of domination consists of these resource arrays and power relations. The facility modality represents the means by which agents draw on resources in interaction, for instance, using one's authority, organisation, or tools (technology, money, etc.) to get something done. When an agent exerts influence or achieves goals by employing resources, they engage in power interactions, enacting structures of domination. Giddens emphasises that power, in his framework, is not only repressive but also productive, it is the "transformative capacity" inherent in action [Dickey-Clark, 1987]. Every time agents use resources (say, a manager leveraging organisational rules or an individual using economic assets), they reinforce the structure of domination that grants those resources power. Notably, power is a two-way relation, subordinates can also resist or use alternate resources, so domination always involves dynamic negotiation. Through repeated use of facilities in interaction, the distribution of resources and influence in a social system is reproduced over time.

– Legitimation (Norms): This dimension pertains to the moral order – the norms, values, and standards by which behaviour is judged. The corresponding modality is the norm (or normative rules), which agents invoke to evaluate conduct and sanction (reward or punish) behaviour. Structures of legitimation are essentially the institutionalised norms and legal or moral rules that define what is considered appropriate, acceptable, or obligatory in society [Dickey-Clark, 1987]. In interaction, actors draw on normative schemas ("rules of the game" in the moral sense) to justify their actions or to call others to account. This produces sanctions as the interaction aspect: maintaining social order by approving right actions and disapproving or penalising deviance. For example, professional codes of conduct or cultural expectations about etiquette are part of the legitimation structure; people adhere to them (or risk sanctions), thereby reinforcing those normative structures. Giddens notes that every act involves some evaluation against norms, even if tacitly – when we follow societal rules we reinforce them, and when we break them we typically encounter some form of sanction

(from informal disapproval to formal punishment) [Loyal, 2003]. Through this ongoing referencing of norms in practice, the value framework of society (its structure of legitimation) is sustained and evolves.

Crucially, Giddens insists that these three dimensions are not separate strands of activity but are analytically distinguishable aspects of the same social practices. In any given interaction, signification, domination, and legitimation intermingle. An utterance in a meeting, for instance, simultaneously conveys meaning (drawing on interpretive schemes), exercises power or influence (using resources like one's authority or expertise), and aligns with or against norms (invoking legitimate expectations of conduct). Giddens cautions that the tri-dimensional schema should be seen as an analytical tool – in concrete social life, "actual social practices combine all three elements in different ways" [Loyal, 2003]. The modalities of structuration (interpretive schemes, facilities, norms) are points of intersection where agents actively mediate structural constraints and their own action, thereby routinely (re)producing the structure in a somewhat unpredictable, negotiable manner.

Relevance

In summary, structuration theory provides a robust conceptual foundation for analysing the interplay between social structure and human agency. Its key elements and the duality of structure together explain how social order is maintained and changed. This theoretical lens is valuable for bridging socio-technical aspects of phenomena because it recognises that technology, organisational procedures, and cultural norms all get woven into the "rules and resources" that shape action, while human actors can, in turn, utilise and transform those structural elements. By grounding analysis in the duality of structure, researchers (such as in the field of construction lessons learned) can account for both the structural context (e.g. organizational policies, knowledge systems, cultural norms) and the agency of individuals or groups (their behaviours, innovations, and adaptations) in a unified way.

To translate the theoretical lens of structuration into an actionable analytic framework, this thesis adopts the desire-path approach (section 4.3.2), which compares 'work as imagined' and 'work as done' to identify and integrate informal practices into formal procedures.

4.2.2 Desire-Path Approach

While structuration theory provides a broad conceptual lens to understand the interplay of structure and agency, its application in organisational settings requires a more operational framework. For this purpose, the thesis draws on

Knoth's desire-path approach, which adapts the metaphor of desire paths—informal trails created by repeated use—to the design and development of organisational structures (Knoth, 2022). The central premise is that informal practices reveal underlying needs and motives; rather than being dismissed as deviations, these practices can be systematically analysed to inform the redesign of formal procedures.

Knoth proposes a five-step procedure to bridge formal and informal practices:

1. Formal Mapping: Identify and document existing formalised processes, procedures, and codified routines.
2. Informal Mapping: Capture actual practices through participatory observation and staff input, revealing how processes unfold in day-to-day work.
3. Interpretation: Analyse the assumptions, motives, and contextual factors behind deviations, distinguishing between efficiency-driven shortcuts and resistance behaviours.
4. Evaluation: Differentiate functional from dysfunctional practices by assessing their results, simplicity, and fit with actors' capabilities and motivations.
5. Integration: Codify revised processes that incorporate valuable informal practices while replacing those that undermine organisational effectiveness.

By comparing "work as imagined" with "work as done," the desire-path framework operationalises structuration theory in a way that makes the recursive relationship between agency and structure empirically visible. Within this research, the first two steps (formal and informal mapping) are employed in the empirical phase, while interpretation, evaluation, and integration are developed through analysis and synthesis in the framework and recommendations.

4.2.3 Stage-Gate Process

The Stage-Gate process provides a structured approach for project planning and review, dividing projects into phases separated by decision points—or gates—where performance is evaluated, and strategic choices are made. This framework, initially developed for innovation and portfolio management, has proven valuable for embedding learning mechanisms into the project life cycle, allowing Lessons Learned (LL) to be captured and operationalised throughout the process rather than only retrospectively [Carrillo, 2005; Schindler & Eppler, 2003].

Structured Learning and Integration

The gate-based structure creates natural moments for reflection and decision-making, aligning well with the identification, dissemination, and application cycle of LL. Carrillo [2005] argues that gate reviews offer a systematic opportunity to integrate feedback and insights from earlier phases. Instead of viewing LL as a post-project activity, Carrillo highlights their role in adjusting scope, design, or strategy proactively during delivery.

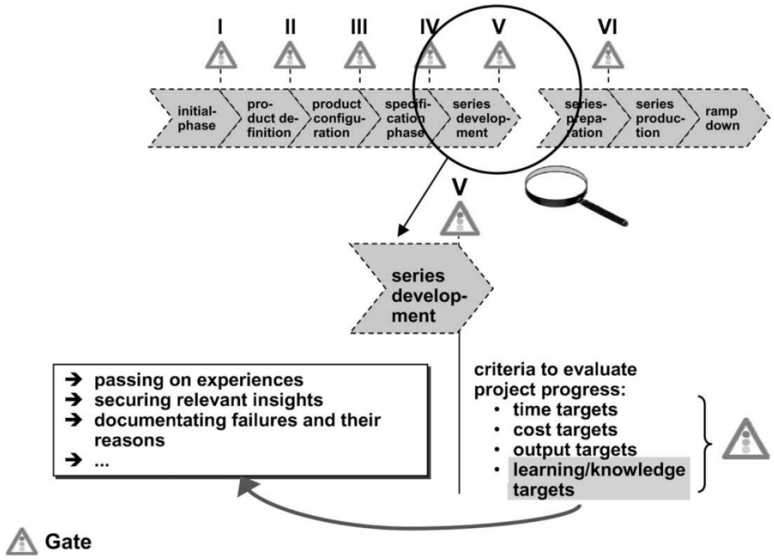


Fig. 11 Stage-Gate Process Scheme (example)

Schindler and Eppler (2003) reinforce this view by outlining a schematic learning model based on three core stages—definition, dissemination, and exploitation—that can be embedded into the Stage-Gate timeline. Their periodic learning approach provides a way to formalise LL across phases while preventing knowledge erosion due to time lags. A key contribution here is their emphasis on project learning goals defined early and reassessed at each gate, supporting alignment between intended and realised learning.

Governance, Timing and Actionability

Kerzner (2009) expands the Stage-Gate concept by describing gatekeeping as a governance tool, where diverse criteria, including knowledge and process insights, are assessed alongside technical and financial metrics. Gatekeepers thus play a dual role: ensuring accountability and serving as facilitators of organisational learning. This perspective elevates LL from a documentation task to a governance activity embedded in project culture.

The timing of LL remains a critical issue. Rowe & Sikes [2006] argue that post-project LL often leads to missed insights, proposing instead an ongoing model

of reflection embedded at earlier phases. Their emphasis on continuous learning aligns with Schindler and Eppler's periodic approach and supports the integration of LL into both planned and emergent review points.

Milton [2010] adds an actionable layer to this discussion. He stresses that lessons must not only be captured but assigned and implemented, with clear ownership and follow-up mechanisms in place. LL reviews at gates should validate whether previous lessons have been applied, and if not, understand the cultural or organisational barriers. Milton [2010] also underlines the importance of a supportive culture, where leadership, incentives, and behavioural norms promote meaningful engagement with learning mechanisms.

Relevance

The Stage-Gate process, when used effectively, serves as both a technical scaffolding and social enabler of learning. It creates procedural opportunities to systematise LL while offering a platform for behavioural reinforcement. However, its success depends on combining formal structures—such as gatekeeping, timing, and evaluation—with cultural conditions that promote accountability, shared ownership, and continuous engagement. This dual role aligns well with the socio-technical ambition of this thesis, where LL are not just seen as data points to be archived but as dynamic insights that evolve through processes and people.

4.3 The three Domains

Structuration theory highlights the recursive interplay between agency and structure: agents enact practices that draw upon existing rules and resources, and these actions simultaneously reproduce or adapt the structural conditions under which future practices unfold. This "duality of structure" offers a particularly useful lens for conceptualising the organisational dynamics of Lessons Learned (LL).

In LL practice, the agency side of this duality manifests primarily in networks. Learning is not an individual act of recall but a relational one, dependent on how people share, interpret, and reframe knowledge with others. Informal conversations, peer advice, and communities of practice all represent the social systems through which agents mobilise their capacity to act. These networks embody the agency dimension because they are constituted by the interactions and choices of actors, yet they also channel how organisational knowledge flows.

The structural side of the duality is represented by systems. These include the technological (repositories, portals) and procedural infrastructures (templates, evaluation practices, and governance mechanisms), that codify rules and make resources available. Systems provide stability and continuity across time, enabling knowledge to be stored, retrieved, and monitored beyond the actions of individual agents. At the same time, their effectiveness depends on being enacted in practice: systems exist only insofar as they are used, adapted, or resisted.

Between these two poles sits the figure of the coordinator. Coordinators embody the hinge between agency and structure, as they are empowered by formal authority and organisational resources, yet operate directly within teams and projects. Their role is to mediate between systemic rules and human agency: facilitating networks, ensuring that systems are used, and legitimising LL processes within day-to-day practices. Coordinators thus represent the most direct interface where the duality of structure becomes visible in practice.

Together, the three domains – networks, systems, and coordinators – (depicted in the below Fig. 12) offer a pragmatic categorisation of LL practices. They translate the abstract principles of structuration into an operational lens: networks represent agency, systems represent structure, and coordinators connect the two. This tripartite view provides a foundation for the empirical evidence, the analysis, and the organisational context mappings, ensuring continuity throughout the thesis.

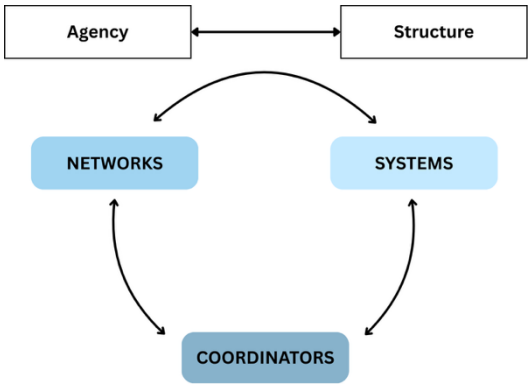


Fig. 12 Three Domains [Author]

5 EMPIRICAL RESEARCH

This chapter reports the empirical component of this study, designed to investigate how Lessons Learned (LL) practices manifest within construction client organisations. It builds upon the foundations laid in the theoretical chapters and aims to explore the interplay between technical processes and behavioural factors in practice. The central goal is to understand how LL is currently conducted, perceived, and constrained by agents working within client organisations, and how these practices might be improved. Semi-structured interviews were chosen as the primary qualitative method to access in-depth, context-specific knowledge from professionals directly involved in managing and applying LL in complex infrastructure projects.

5.1 Considerations & Set-Up

This chapter is structured in six parts. First, it presents the rationale for the empirical research design, including the justification for semi-structured interviews. Second, it outlines the sampling strategy employed to recruit participants with diverse perspectives from major Dutch client organisations. Third, the interview protocol is introduced, reflecting the synthesis of the literature review and the overarching research objectives. Fourth, the ethical procedures adopted to ensure confidentiality and integrity are described. Fifth, the data analysis methodology (qualitative thematic coding via Atlas.ti) is explained. Finally, an overview of the conducted interviews is presented, setting the stage for the findings section.

5.1.1 Introduction to the Empirical Approach

To uncover how LL practices are operationalised in practice and how client organisations navigate behavioural challenges, this empirical phase collects insights directly from practitioners through semi-structured interviews. These interviews aim to go beyond formal procedures and explore the lived experiences, perceptions, and organisational dynamics that shape LL practices.

The empirical component supports the following objectives:

- Explore how technical processes and tools for LL are developed and maintained within client organisations.
- Investigate behavioural patterns, social dynamics, and cultural norms that influence LL.
- Understand how LL is embedded (or not) within the broader organisational systems of client organisations.

Semi-structured interviews were selected because they offer both structure and flexibility. This method enables the researcher to investigate specific themes derived from theory – such as LL phases, tools, and behavioural enablers – while also allowing interviewees to elaborate on unanticipated or context-specific dynamics. Given the complexity and socially embedded nature of LL practices, this approach is considered appropriate to obtain deep, nuanced, and diverse perspectives.

5.1.2 Organisation Selection

To address the main research question (MRQ) and sub-question two (RQ2; see Chapter 2.2), a deliberate selection of case organisations was made. The aim was to construct a diversified portfolio of client organisations. This variation ensures that cross-contextual dynamics of lessons learned (LL) practices can be meaningfully explored across the Dutch infrastructure sector.

Four infrastructure clients were selected to reflect this diversity:

- TenneT: A fully government-owned entity operating under private law, responsible for high-voltage electricity transmission and large-scale grid infrastructure.
- Port of Rotterdam: A public limited company jointly owned by the municipality and the state, operating commercially while serving public interests.
- Rijkswaterstaat: A fully public agency under the Ministry of Infrastructure and Water Management, characterised by long-standing bureaucratic structures and formalised processes.
- Porthos: A joint venture combining public and private actors for CO_2 transport and storage, representing a hybrid governance setting with collaborative coordination mechanisms.

This selection was not random, but methodologically motivated by the need to observe and compare LL practices across contrasting institutional settings. Including public, private, and hybrid organisational forms enables the research to explore how organisational characteristics shape LL processes and to provide a robust basis for comparative insight.

5.1.3 Expertise Selection

The empirical research focuses specifically on construction client organisations, as they are the primary context of analysis. The selection of interviewees was driven by the intent to gain rich insights from those involved in project governance, knowledge management, and LL implementation. Instead of applying a rigid sampling framework, individuals were identified based on their relevance to the research focus and their ability to reflect diverse experiences within the Dutch infrastructure sector.

The selection criteria were:

- Active involvement in project delivery within a client organisation.
- Experience with processes involving project knowledge transfer, LL, or organisational learning.
- Representation across various management roles to capture diverse viewpoints.

Participants were drawn from four major infrastructure clients in the Netherlands: Port of Rotterdam, TenneT, Rijkswaterstaat, and Porthos (a joint venture). Within these organisations, the focus was on engaging with professionals in managerial roles (such as contract managers, project managers, and process coordinators), who could speak to both the strategic and operational dimensions of LL. This design ensures a variety of perspectives on how LL is facilitated, resisted, and embedded within client structures.

5.1.4 Interview Protocol

The interview protocol was designed to explore both the technical and behavioural dimensions of Lessons Learned (LL) practices in client organisations. Informed by the synthesis of the literature review and the socio-technical perspective of this research, the protocol focuses on the interplay between formal processes and informal behavioural patterns that shape LL practices in the field.

The protocol adopts a semi-structured format, enabling the researcher to maintain consistency across interviews while also allowing flexibility to follow relevant digressions or emerging themes. This is particularly important given the partial exploratory nature of the study and the aim to uncover latent cultural norms, informal routines, and organisational dynamics not always captured in formal systems.

The interviews were structured around three overarching thematic blocks:

- Perceptions and Interpretations: How LL is understood across different roles and contexts, including the types of knowledge considered valuable, and the psychological or cultural barriers to sharing.
- Processes and Responsibilities: How LL practices are currently initiated, documented, and shared, including who takes responsibility and how formalisation affects engagement.
- Implementation and Organisational Dynamics: How lessons are (or are not) transferred between projects and embedded into new initiatives, and what broader organisational structures help or hinder this process.

Each interview began with introductory questions about the participant's role and project context, then moved through progressively deeper inquiries on sharing practices, and improvement suggestions. A reflective section was included at the end to gather visionary input on what an ideal LL system might look like.

The protocol was intentionally crafted to stimulate both critical reflection and practical storytelling, allowing interviewees to draw from lived experiences. A copy of the full interview protocol is included in the Appendix (Appendix 1).

5.1.5 Ethical Implications

This research complies with the Human Research Ethics procedures of Delft University of Technology. The study was reviewed and approved by the TU Delft Human Research Ethics Committee (HREC), following the submission of the required materials including the HREC checklist, Informed Consent Form (ICTG), and a Data Management Plan (DMP).

All participants were informed about the goals of the study, the voluntary nature of their participation, and the measures taken to ensure anonymity. Written informed consent was obtained before each interview. Interviews were audio-recorded with permission, transcribed, and anonymised. All data are stored securely on TU Delft's OneDrive environment. Access is restricted to the researcher and supervisors. Audio files are deleted after transcription, and anonymised transcripts will be archived for academic purposes under secure conditions. No personal or identifiable information is used in this thesis.

5.1.6 Data Analysis

The interviews were analysed using a qualitative thematic approach, conducted through the ATLAS.ti software. This method allows the researcher to identify recurring patterns and categories that emerge from the data without pre-imposing theoretical labels.

The process began with open coding of each interview transcript. Codes were iteratively refined into broader themes that capture key topics such as: the presence or absence of LL systems, behavioural barriers to sharing knowledge, the role of leadership, and strategies for process improvement. These themes are informed by the interview data but also indirectly relate to the socio-technical synthesis established in the literature review.
A codebook was developed to document definitions and interrelationships among codes, and this serves as the foundation for the empirical findings presented in the next section. The findings chapter is structured around these themes to provide an accessible and robust account of the interview results, while setting the stage for theoretical analysis in the following chapter.

5.2 Empirical Findings

This chapter presents the empirical findings derived from semi-structured interviews with professionals working across Dutch infrastructure client organisations. The analysis followed an iterative coding process that produced a structured codebook, which was subsequently reorganised around three interdependent domains: Networks, Systems, and Coordinators. Introduced earlier through the lens of structuration theory, these domains provide a coherent backbone for the thesis, ensuring that findings are not only thematically organised but also analytically consistent. Their intersections are illustrated in Figure 13, which serves both as a visual summary and as a guide to the structure of this chapter.

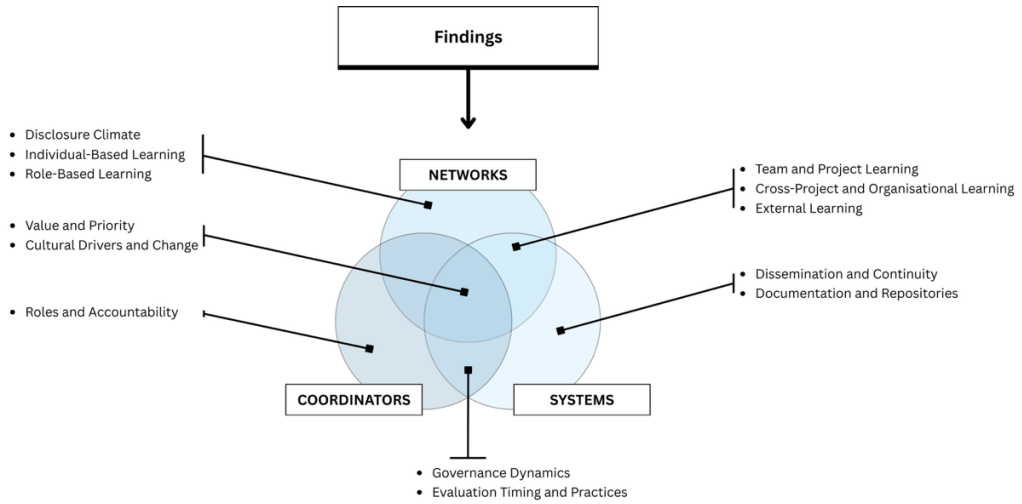


Fig. 13 Findings' thematic areas [Author]

Findings are presented thematically, combining analytical interpretation with direct citations from the interviews. In some cases, quotes or concepts may appear across multiple sections; This reflects their relevance to more than one

thematic area, as the same input can provide distinct insights depending on the lens through which it is analysed. Additionally, while all interview quotations remain faithful to the meaning and intent of the original statements, minor editorial adjustments have been made solely to enhance grammar, readability, and coherence for the reader.

Together, these findings provide a rich and multi-layered account of how Lessons Learned (LL) practices are shaped not only by formal systems and governance, but also by behavioural dynamics, cultural norms, and multi-level learning processes within and across projects.

5.2.1 Networks

In client organisations, Lessons Learned (LL) practices rely heavily on networks of people rather than on formal procedures. Knowledge often circulates through trust-based exchanges, informal conversations, or role-specific communities, which makes these networks highly effective for immediate transfer but difficult to capture in institutional memory. At the same time, openness within teams can quickly turn into restraint in multi-party settings, where contractual or reputational concerns limit disclosure. Networks therefore form both the backbone of LL in practice and a point of fragility when continuity depends on individual initiative.

Disclosure Climate

A recurring theme across organisations is the extent to which Lessons Learned (LL) practices foster openness—or, conversely, strategic filtering of information—depending on the social and contractual setting. Within internal project teams, knowledge exchange was generally described as candid and informal, supported by familiarity and mutual trust. Respondents stressed that discussions often happen spontaneously, without fear of judgment:

> *"Sharing a lesson at the coffee machine is always more impactful because you have a personal link." (Project Manager, PTS_01)*

> *"Within the project team, there is no issue. People say what went wrong because they know each other." (Contract Manager, PTS_02)*

Such openness was considered the norm internally, where competitive stakes are minimal and the focus remains on practical improvement. As one respondent explained:

> *"I generally think a lesson learned is more something practical… it's hard to make that a strategic advantage." (Contract Manager, PTS_01)*

However, this openness shifts in multi-party settings that include contractors or joint venture partners. Interviewees noted that such environments create caution, with people holding back information or framing it strategically. Concerns about blame, reputational risk, or financial claims often shaped behaviour:

> *"You can talk freely within your own team, but when you involve contractors, there is always an agenda… They don't want claims, we don't want claims, so things stay unspoken." (Project Manager, POR_03)*

> *"As soon as you have the contractor at the table, people hold back. They think: better not share, it might be used against us later." (Project Manager, TNT_03)*

> *"People are afraid to share something because they think the contractor can turn it into profit… So they keep quiet." (Contract Manager, RWS_01)*

This contrast illustrates a boundary between internal transparency and external strategic restraint. While within-team discussions are characterised by openness, the presence of external parties tends to introduce hidden agendas that constrain disclosure.

Notably, when strategic behaviour did occur internally, it was seen as rare and more related to personal characteristics than to organisational culture. Interviewees pointed to professional maturity and confidence as enablers of openness, whereas ego-driven or insecure individuals were more likely to withhold:

> *"If you are competent and secure, you have no problem sharing. If you're insecure or trying to climb the ladder, then maybe you hold something back. But honestly, those people are not the best ones." (Project Manager, PTS_03)*

> *"If you want LL to work, start with the right people—professionals who like to share and improve their work. That's the foundation." (Contract Manager, PTS_01)*

At times, such ego surfaced in role-specific groups, particularly where professional authority was at stake:

> *"When you have a room full of contract managers, ego often comes into play and people want to show that their way was the best." (Project Manager, PTS_03)*

Overall, disclosure climates in LL activities depend strongly on context. Internal settings generally foster candour and trust, while external, contractor-involved sessions often constrain openness and promote strategic behaviour.

Even within organisations, individual attitudes and group dynamics can shape disclosure, underscoring the sensitivity of LL practices to both social trust and contractual context.

Individual-Based Learning

Across all organisations, interviewees emphasised that Lessons Learned (LL) often depend less on formal systems and more on individuals themselves. Knowledge flows primarily through interpersonal networks, informal exchanges, and the tacit learning that professionals carry with them as they move through their careers. As one respondent explained:

> *"Only if the people go from project to project, they take their lessons with them… You don't hand over a paper to the next team. They just start over." (Contract Manager, RWS_01)*

This reliance on individuals makes informal channels—coffee breaks, phone calls, or even social gatherings—key vehicles for knowledge transfer. Respondents frequently stressed that these interactions feel more effective and trustworthy than formal mechanisms:

> *"Sharing a lesson at the coffee machine is always more impactful… It's more personal, and that's the annoying thing about this subject—it's psychology." (Contract Manager, PTS_01)*

> *"It works very well to just go and have a beer Friday afternoon or organise a barbecue at the start of a project… No speeches, just a relaxed setting where people talk." (Contract Manager, POR_01)*

Alongside these interpersonal exchanges, participants highlighted that individuals continuously engage in personal learning, adjusting their behaviour based on past experiences even when this is not labelled as LL.

> *"Personal learning happens automatically… You bring it along in your career. The challenge is to make it useful for the organisation." (Project Manager, TNT_02)*

> *"I think it is something that everyone does in their day-to-day business, but maybe not so explicit… Everyone wants to get better at what they do." (Contract Manager, PTS_02)*

Such tacit learning ensures continuity at the micro level, but it depends entirely on personal motivation and memory. As one respondent admitted, the process often ends with individual reflection rather than organisational uptake:

> *"Personally, for me, if this would help me in something, then I would write it down… but that's where it generally ends. There is not a next step of verifying if everybody is taking care of the lessons learned." (Contract Manager, PTS_01)*

Participants also noted that openness to learning varies with personality and seniority. While younger staff often embrace new insights, senior professionals sometimes feel they "already know enough," creating psychological barriers to sharing. This highlights how professional maturity, confidence, and even ego shape how personal lessons are transformed—or not—into organisational knowledge.

Taken together, these reflections underline that person-centred learning is both a strength and a vulnerability. It ensures that experience is carried forward by individuals, but it also means that when key staff leave or shift roles, valuable lessons risk being lost, regardless of formal documentation systems.

Role-Based Learning

Interviews revealed that while Lessons Learned (LL) is discussed broadly, its practical application often depends on functional roles, especially for highly specialised knowledge. Respondents explained that lessons tied to technical or procedural expertise are rarely relevant for all disciplines within a project team, making role-based exchanges an important complement to team-level discussions. As one participant noted:

> *"I would prefer talking to similar roles because they understand each other better. They talk the same language, have the same work package and responsibilities, so they can share experiences better with each other and it is more applicable to them." (Contract Manager, PTS_02)*

Several interviewees stressed that when lessons are highly technical—such as design details, construction methods, or process adjustments—they should primarily target colleagues performing the same role. Otherwise, sharing risks becoming inefficient and disengaging for others:

> *"If someone on the construction site has found a way to pour concrete more efficiently, yeah, what is a project manager going to discuss with the other project manager concerning this topic? It does not resonate for that." (Contract Manager, PTS_02)*

This preference for role-specific exchanges was linked to the practicality and relevance of knowledge transfer. Within client organisations, some structures already facilitate such interactions. TenneT, for example, uses a matrix organisation where functional departments maintain regular meetings

alongside project-based work, creating space for peer-to-peer learning among specialists:

> *"In that matrix, the contract managers align better because they also see each other at department meetings… That helps with gaining lessons from one contract manager to the next one on the next project." (Contract Manager, TNT_01)*

However, respondents acknowledged that these practices remain largely informal and inconsistent. Where role-based meetings do occur, they were described as highly effective for resolving recurring issues and standardising best practices within professional communities. One participant summarised this advantage by noting that such exchanges enable targeted learning without overburdening mixed-role sessions:

> *"When the topic is very technical, you need your specialists together. Otherwise, people lose interest." (Project Control Manager, POR_02)*

Despite their benefits, role-based learning is not systematically embedded in LL frameworks. Instead, it relies on departmental initiative or individual effort, leaving its impact uneven across organisations. The findings suggest that formal LL systems should recognise the value of role-specific knowledge transfer while ensuring integration with project-level and organisational learning processes.

5.2.2 Networks & Systems

While networks provide the immediate channels for sharing lessons, systems are the means through which organisations attempt to formalise and scale these practices. Across the cases, this interplay proved central: project teams often succeed in identifying lessons informally, yet struggle to translate them into structures that persist beyond the project itself. Efforts to institutionalise LL through governance mechanisms, databases, or cross-project programmes highlight both the opportunities for wider impact and the persistent gaps between local adaptation and organisational integration.

Team and Project Learning

At the project level, learning typically occurs through two complementary mechanisms: structured evaluation sessions and informal day-to-day exchanges. These settings allow project teams to reflect on performance, identify issues, and make adjustments within the project lifecycle. Most organisations mandate end-of-project evaluations, while some, such as Port of

Rotterdam, go further by organising interim sessions to address emerging challenges collaboratively:

> *"We have evaluations at the end of every project, but also interim sessions when needed. We bring in key players from both our team and the contractor to look at what is going well and what isn't." (Contract Manager, POR_01)*

Participants highlighted the value of mixed-role discussions for providing diverse perspectives, particularly on process improvements:

> *"In a team with different backgrounds, you get a more complete spectrum of lessons… That's very valuable for improving processes." (Contract Manager, POR_01)*

However, several respondents cautioned that such sessions need focus to remain effective. Topics that are too technical or irrelevant to certain roles were seen as diminishing engagement, reinforcing the importance of tailoring discussions:

> *"If you bring up something very specific to one discipline, people lose interest quickly." (Project Control Manager, POR_02)*

Informal exchanges were equally important, particularly during daily interactions or progress meetings. These spontaneous conversations, often triggered by observed inefficiencies or practical issues, foster a culture of continuous adjustment:

> *"If you work closely on the same project, you just share what you see could be done better. You don't hold back—because fixing this project is what matters." (Project Manager, PTS_03)*

Despite these benefits, interviewees consistently noted that lessons identified at the team level seldom transcend project boundaries. Formal reports are produced, but their implementation or reuse across projects remains uncertain:

> *"We organise sessions after each phase… but translating that into organisational change is another story." (Project Manager, POR_03)*

The findings suggest that while project teams provide a fertile ground for learning and immediate improvement, these practices operate largely in isolation. Without stronger mechanisms to capture and redistribute insights beyond the originating project, team-level learning risks reinforcing short-term adaptation rather than driving systemic progress.

Cross-Project and Organisational Learning

Moving from project-level reflection to organisational learning emerged as one of the most persistent challenges across interviews. Several respondents emphasised that the temporary nature of project teams severely limits the continuity of knowledge transfer. Once a project is completed, teams disband, and the knowledge they generated often dissolves with them:

> *"People in the projects that I do talk about it like 'oh, this is something we could take to the next project'. But my projects are all one-off with newly built project organisations, and after the project is finished they tend to cease to exist… To transfer lessons across those formally is difficult." (Contract Manager, PTS_02)*

This dependency on individual mobility—where learning travels only if people move to the next assignment—creates a structural vulnerability:

> *"Only if people move from project to project do lessons really transfer… Otherwise, teams start from scratch." (Contract Manager, RWS_01)*

Context sensitivity further compounds the problem. Interviewees repeatedly stressed that lessons cannot simply be replicated without adjustment because each project introduces unique conditions—technical, contractual, or organisational—that shape outcomes:

> *"You need to analyse in what context the lesson was made… If you apply it in a different context, it may not work, so you have to adjust." (Contract Manager, PTS_02)*

Standardised programmes, such as TenneT's grid expansions, were described as more conducive to reapplying lessons, while unique ventures—like Porthos—make generalisation harder. Recognising this challenge, some organisations are exploring structural solutions to reduce contextual variation. At Port of Rotterdam, for example, the idea of clustering similar projects was highlighted as a way to foster knowledge continuity:

> *"We try to cluster projects by type, so that the same people work on similar projects. That helps with quality and with knowledge management." (Project Control Manager, POR_02)*

Despite these efforts, the gap between project-based learning and organisational integration remains significant. Systems like Port Wizard or technical manuals aim to capture insights, but their effectiveness depends on governance and clear role ownership. Without mechanisms that combine structured processes with behavioural incentives, lessons risk either being stored without impact or misapplied in contexts where they do not fit.

External Learning

Learning across organisational boundaries introduces complexities that extend beyond technical processes, hinging largely on trust and contractual dynamics. While joint evaluation sessions with contractors are common, interviewees agreed that these discussions are rarely fully transparent, as both parties manage what they share to protect commercial interests:

> *"You cannot be fully transparent when the other party might use it against you… so real lessons stay inside." (Contract Manager, RWS_01)*

This dynamic is rooted in the structural nature of client–contractor relationships, where conflicting objectives—cost control for clients versus profitability for contractors—create an inherent tension:

> *"The main goal for a contractor is realising work and having some profit… For clients, it's the other way around: get the maximum amount of work for the least amount of money. So there is a conflict of interest. But at the same time, the project result is something we both need." (Contract Manager, POR_01)*

As a result, many participants stressed that the real value of external LL lies less in uncovering every operational detail and more in capturing how the collaboration worked, including the strengths, weaknesses, and behavioural patterns of partners. This knowledge enables client organisations to prepare for future engagements with the same contractors, informing negotiation strategies and relationship management:

> *"When you work together again, you want to know what worked well and what didn't—so you know how to organise things better next time." (Project Manager, TNT_03)*

Some organisations pursue structured approaches to facilitate this, including end-of-project workshops that bring together client and contractor teams. These sessions were described as valuable for aligning expectations and reinforcing partnerships, even if their contribution to systemic learning is limited:

> *"We go three or four times a year with the contractor and have sessions about how we work together… We write down actions to make cooperation better. It helps build trust, even if translating it into work later is difficult." (Contract Manager, RWS_01)*

The findings indicate that while external LL efforts often stop short of complete openness, they provide critical relational insights that shape future collaborations. As TNT_03 observed, the benefits of such exchanges extend beyond immediate projects when organisations operate under framework

agreements or recurring partnerships, where lessons about cooperation can be institutionalised across programmes. Conversely, in one-off projects, the absence of continuity limits the long-term value of external learning, underscoring the need for structured follow-up to convert relationship-based knowledge into organisational capability.

5.2.3 Systems

Systems represent the formal backbone of Lessons Learned (LL) practices, intended to capture knowledge and ensure its reuse across projects. Most client organisations rely on repositories, templates, or digital platforms to embed LL in governance processes. Yet interview findings reveal persistent gaps: while documentation is abundant, continuity and implementation remain weak, as lessons rarely move beyond storage to actionable change. This reliance on systems illustrates both their potential to institutionalise learning and their limitations when cultural and behavioural alignment is lacking.

Dissemination and Continuity

While many organisations succeed in capturing lessons, ensuring their integration into future projects remains a critical and unresolved issue. Interviews consistently revealed that the chain from identification to implementation is rarely closed, resulting in knowledge being documented but seldom applied in practice. This disconnect raises fundamental concerns about the effectiveness of current LL processes.

The first barrier lies in the transition from capture to action. Several respondents emphasised that lessons tend to stop at the documentation stage, with no structured follow-up or accountability for embedding recommendations into operational systems.

> *"I think the main part of lessons learned is one, gathering them, and two, making sure they stick. And how do things stick? It's the most difficult thing." (Contract Manager, PTS_01)*

Similar concerns were echoed by participants across organisations, including TNT_01, TNT_02, and POR_01, all noting that reports often become static outputs without influencing decision-making. RWS_01 summarised the frustration succinctly:

> *"I know from experience… all these reports, they go into a big drawer and you never see them again." (Contract Manager, RWS_01)*

When asked why this gap persists, many participants pointed to a strong reliance on informal networks over formal systems. When faced with a new challenge, project managers rarely consult repositories, opting instead to leverage personal contacts.

> *"Still, we rely a lot on the network of people… That works better than just doing databases and stuff." (Project Manager, POR_01)*

> *"Scenario 1: search SharePoint, get 1300 results… Scenario 2: have a conversation over coffee. One hour and he could go on." (Project Manager, PTS_03)*

Although organisations have invested in digital solutions such as Port of Rotterdam's Port Wizard, usability and engagement remain significant barriers. As POR_02 admitted in a separate discussion, even structured repositories fail if users do not trust or value the system.

Another factor constraining continuity is the lack of clear ownership for implementing lessons beyond the originating project. Responsibilities often fall to project teams, who are simultaneously under pressure to close their work and move on. POR_01 illustrated this challenge:

> *"We have reports of that evaluation with a couple of recommendations… but the project team that makes the recommendations is also then responsible for the next step. And that's a bit of a conflict of interest, because when I'm almost done with this project I get pulled on the next project." (Contract Manager, POR_01)*

Finally, interviewees highlighted relevance and targeting as critical for successful dissemination. Lessons must be framed in a way that resonates with future users. As TNT_01 explained:

> *"It needs to be spot on for other people to accept… to recognise: 'OK, this could happen to me because it happened in a similar project'." (Project Manager, TNT_01)*

TNT_03 added that timing and stakeholder involvement are equally important for uptake:

> *"If the right people are not there at the right moment, the lesson just stays on paper. It never makes it into the work." (Project Manager, TNT_03)*

These insights underline a systemic weakness: while organisations can capture lessons, they struggle to make them actionable and relevant for future projects. Overreliance on informal sharing, combined with weak role accountability and limited contextualisation, perpetuates this implementation gap. Initiatives such as action-oriented recommendations (POR_03) and

knowledge-sharing meetings (TNT_01) represent steps in the right direction, yet remain isolated rather than embedded in a coherent organisational process.

Documentation and Repositories

One of the most persistent challenges identified in formalising Lessons Learned (LL) practices lies in the reliance on documentation systems—whether spreadsheets, shared folders, or centralised repositories. These tools are designed to secure institutional memory, but interviews consistently revealed that their practical use is limited. As several participants observed, repositories often serve as end points rather than dynamic enablers of learning:

> *"We write it down, put it somewhere in a database, and then it stops… The next project is not using it." (Project Manager, TNT_02)*

The frustration was not only about visibility but also about usability and relevance. Spreadsheets and SharePoint libraries were repeatedly criticised as static, difficult to navigate, and disconnected from the realities of project work. One manager illustrated the perceived inefficiency with a vivid comparison:

> *"Scenario 1: drive to the main office, log in, search SharePoint within millions of lessons learned. Have a tag or a keyword and hopefully I get something out of it that matches my problem… 1300 results. Oh, what the ****? Which one is mine? Scenario 2: have a conversation over coffee. One hour and he could go on." (Project Manager, PTS_03)*

The limitations of static repositories are compounded when no follow-up mechanisms exist to transform stored insights into actionable changes. As POR_02 emphasised, documentation alone cannot close the LL loop:

> *"We don't believe in just a lesson learned list—we make action-oriented recommendations that feed into procedures and templates." (Project Control Manager, POR_02)*

While organisations such as Port of Rotterdam have invested in improving digital solutions, introducing Port Wizard to integrate knowledge into the quality system, the cultural barrier persists. Despite its advanced features, engagement remains highly dependent on individuals' willingness to consult the tool and act on its content. POR_02 reflected candidly:

> *"Knowledge is in people's minds… The system is there, but behaviour decides whether it works." (Project Control Manager, POR_02)*

This sentiment was echoed by TNT_03, who argued that repositories should serve as supporting tools, not substitutes for human interaction:

> *"I don't like systems because it's really easy to say we have a database, which looks beautiful, but it's only a database. The purpose is that somebody else implements it in the project. If you only use the system as the channel, it doesn't work." (Project Manager, TNT_03)*

Participants repeatedly stressed that networks and dialogue remain critical for effective knowledge transfer, particularly in contexts where timing and project complexity make rigid systems impractical. In the words of one respondent:

> *"It starts with people and then the processes. And if that works, then you create the tool to support it—not the other way around." (Project Manager, TNT_03)*

Taken together, these findings underscore a fundamental weakness: documentation systems alone cannot deliver learning outcomes. Without behavioural alignment, clear accountability, and integration with collaborative practices, repositories risk becoming static archives - technically available but practically unused.

5.2.4 Systems & Coordinators

Systems and coordinators represent the institutional dimension of Lessons Learned (LL) practices, where rules, roles, and timing converge to shape how learning is governed. Formal mechanisms (such as stage-gates, templates, and contractual obligations) aim to embed LL into project lifecycles, while coordinators and leaders act as mediators who legitimise, enable, or constrain their use. Across cases, interviews revealed that the effectiveness of these arrangements depends less on the presence of systems themselves than on governance posture: whether processes are experienced as rigid compliance or as supportive structures. This section examines how organisations balance structure with flexibility, and how timing, ownership, and leadership engagement determine whether LL practices contribute to symbolic reporting or to meaningful organisational improvement.

Governance Dynamics

The way organisations govern Lessons Learned (LL) practices reflects a tension between structure and flexibility, and between top-down and bottom-up dynamics. Across cases, formal LL procedures were often described as mandatory steps—such as contractual clauses, stage-gate evaluations, or quality requirements—embedded into governance systems. Yet many

participants emphasised that these mechanisms frequently serve compliance rather than genuine reflection:

> *"It's just a tick-box in the process… you collect signatures that you've done it, and then it starts and ends there." (Project Manager, TNT_02)*

This scepticism did not amount to a rejection of structure altogether. Respondents stressed that formal processes can be useful when applied with flexibility and practicality. One experienced manager expressed this ambivalence:

> *"I see big corporates like Port of Rotterdam, Rijkswaterstaat, ProRail… they all have lessons learned programmes, and they all are not satisfied with how lessons learned are incorporated. I've never seen a decent lessons learned process working." (Project Manager, PTS_03)*

At the same time, the same participant underlined the importance of having structured reference points:

> *"I believe in processes and I believe in structure, but I don't believe them to be mandatory… I want them to be there so that you have something to fall back on if it doesn't work anymore." (Project Manager, PTS_03)*

This conditional acceptance of structure was visible in practice. Some organisations encouraged adherence to templates without rigid enforcement:

> *"It's normally a rule that you use the most actual templates… but when you don't follow it, nothing really happens." (Project Manager, POR_03)*

Others, however, saw mandatory enforcement as a way to create urgency and prevent neglect:

> *"If you make it part of your work—not optional but mandatory—then there's an urgency. There's no reason not to do it." (Contract Manager, RWS_01)*

This duality highlights how governance posture is shaped not only by rules but also by organisational culture. When formal systems are perceived as disconnected from daily work, engagement tends to be minimal. Conversely, when usability and integration improve, employees show greater willingness to participate. Port of Rotterdam's shift from a static repository to the interactive Port Wizard illustrates this:

> *"Before, we had a system that was basically a lesson-learned list, and everyone was complaining about it… it was not used. Now, with Port Wizard, it's connected to our quality system, so people can easily find who is responsible and what to do. It's much better than what we had before." (Project Control Manager, POR_02)*

Still, participants consistently stressed that structural improvements alone are insufficient. Leadership involvement and cultural reinforcement are equally important. Several respondents argued that most learning originates bottom-up, but without top-down support, insights fail to travel beyond the project level:

> *"It's all bottom-up… the top doesn't spread knowledge, and every project reinvents the wheel." (Contract Manager, RWS_01)*

Others explained that management's role should not be to control LL but to legitimise it by creating time, incentives, and attention:

> *"It is more a topic that comes from bottom-up… But in order for them to share that information to the rest of the organisation, you have to document and talk about it somewhere. The impact from top-down would be to promote that type of behaviour and enable the people and give them the time to talk about it and reflect." (Contract Manager, PTS_02)*

Where such feedback loops were present, LL practices appeared more embedded. For example, Port of Rotterdam uses quarterly cycles to validate and communicate project-level recommendations across the organisation:

> *"Four times a year, all changes are communicated across the organisation… The management validates them and says, 'OK, we agree, implement.' So everyone hears about the new templates, instructions—it's natural." (Project Manager, POR_03)*

Even then, project teams often struggled with competing demands, limiting their ability to implement changes in practice. Respondents emphasised that top-down influence must go beyond issuing rules to fostering cultural conditions in which reflection is safe and valued:

> *"If there is an interest from management, and they address that to the project team, then everyone knows that it is important, and they should invest time in it." (Contract Manager, PTS_02)*

> *"You have to create a culture where it's OK to talk about mistakes... not only in the top of the organisation, but in the entire organisation." (Contract Manager, PTS_02)*

At the same time, participants cautioned that top-down directives risk failure if they are not aligned with internal support:

> *"If you just say top-down 'I want this,' it's bound to go wrong… You need to create some support first." (Contract Manager, PTS_01)*

Overall, the findings suggest that effective LL governance depends on posture and adaptivity. Formalisation works best when it provides structure without rigidity, and when top-down support enables rather than dictates. Where either compliance culture or leadership disengagement dominates, LL practices risk becoming symbolic gestures rather than meaningful contributions to organisational learning.

Evaluation Timing and Practices

A recurring theme across organisations is the challenge of embedding Lessons Learned (LL) evaluations into project lifecycles in a way that balances structure, timing, and engagement. While most organisations have scheduled evaluation points, their effectiveness often depends on how they are implemented and whether they align with project realities.

Stage-Gate Systems were frequently mentioned as the primary governance mechanism intended to institutionalise LL. These frameworks introduce predefined checkpoints between phases, encouraging foresight and continuity across the project lifecycle. Participants acknowledged this as valuable in principle:

> *"You enter the different phases of a project… You have to write a plan and it is mandatory to incorporate lessons learned in this plan. And I believe in that because it starts you thinking beforehand instead of repairing it afterwards." (Project Manager, PTS_03)*

When carried out promptly, stage-gates were praised for keeping knowledge fresh and actionable:

> *"I think it's a good approach. Then it's fresh in the minds and then you actually remember what the lesson learned is." (Project Manager, PTS_03)*

However, many respondents noted that in practice, stage-gates often devolve into compliance exercises, lacking depth and ownership:

> *"No, in your project, you have to do it, and I think it's just tick-boxes in the process… My quality manager says, 'OK, this is the moment.' And then you do it." (Project Manager, TNT_02)*

This critique links directly to broader concerns about timing and sequencing. End-of-project evaluations, though common, were widely described as ineffective, occurring when staff were already moving on and focus had shifted to closure tasks:

> *"If you do it at the end, people have already moved on, and the focus is on finishing, not on reflecting." (Project Manager, TNT_02)*

Several interviewees argued that intermediate evaluations, especially during phase transitions or handovers, would prevent knowledge loss and benefit teams starting similar work:

> *"We should not have been waiting for gathering these lessons learned until the end of the project. We should have done an intermediate one, especially because the next team was already starting." (Project Manager, TNT_01)*

In practice, ad hoc sessions are sometimes used to capture emerging issues, creating hybrid approaches that combine fixed stage-gates with flexible evaluations:

> *"Now we have fixed moments in the projects… but sometimes we have a problem that's actual and then we made the evaluation at that moment." (Project Manager, POR_03)*

Nonetheless, interviewees emphasised that responsibility for LL is often diffuse, with project managers prioritising delivery over reflection:

> *"You need to have more professional approach to have it to be… a program more than a one-off. Somebody should own it, not just the project manager who says: 'We'll deal with that later.'" (Project Manager, TNT_01)*

Finally, participants stressed that evaluation practices are not limited to formal reviews. Informal conversations and social initiatives often provide more candid spaces for reflection than structured sessions:

> *"Scenario 1: drive to the main office, log in, search a database and find 1300 results. Scenario 2: have a conversation over coffee. One hour and he could go on." (Project Manager, PTS_03)*

> *"We have fixed moments in the project… normally after a phase we evaluate the phase before, but sometimes we do it ad hoc when a problem comes up." (Project Manager, POR_03)*

> *"What works very well is just going for a beer on Friday afternoon or organising a big barbecue at the start of the project. No speeches, no presentations—just a relaxed setting where people talk." (Contract Manager, POR_01)*

These accounts underline that while formal systems such as stage-gates provide consistency, their effectiveness depends on timing, ownership, and cultural alignment. Informal exchanges remain indispensable for surfacing sensitive lessons and sustaining engagement. The most effective practices appear to blend both approaches—using formal checkpoints to provide continuity, while allowing space for flexible and relational forms of evaluation.

5.2.5 Coordinators

Coordinators embody the organisational roles through which Lessons Learned (LL) practices are legitimised and sustained. Positioned between project teams and governance systems, they act as the mediators who assign accountability, ensure follow-up, and translate individual insights into organisational processes. While formal systems may provide structure, their effectiveness depends on whether coordinators (project managers, project controllers, or dedicated knowledge roles) take active responsibility for implementation. Interview findings consistently highlight that where ownership is diffuse or absent, LL tends to remain a procedural formality. Conversely, when roles are clearly defined and supported, coordinators become critical enablers of continuity and learning across projects.

Roles and Accountability

Across interviews, a recurring structural weakness in formalising Lessons Learned (LL) practices is the absence of clearly defined ownership. While most organisations have established processes and templates for documenting lessons, their implementation and follow-up often lack dedicated accountability, leaving LL to depend on individual initiative rather than institutional commitment.

Several respondents emphasised that responsibility for LL is rarely formalised in job descriptions, creating ambiguity about who ensures that lessons are embedded into future work. PTS_01 captured this gap:

> *"It's not clear who owns lessons learned. You write them down, and then it ends there. It's not in anyone's job description, so no one follows up." (Contract Manager, PTS_01)*

In many cases, LL tasks are informally assigned to project managers, who prioritise delivery and have limited capacity to enforce knowledge transfer. This approach was widely criticised as ineffective:

> *"Project managers are too busy closing the project… If LL is left to them, it becomes an afterthought." (Project Manager, TNT_01)*

To address this issue, several interviewees proposed creating dedicated roles within PMO or quality departments to coordinate LL activities across projects. TNT_02 suggested that such roles would strengthen continuity and accountability, reducing the current reliance on informal efforts. Similarly, Port of Rotterdam partially mitigates this gap by delegating LL-related tasks to project control managers:

> *"We don't put it on the project manager alone. Project control has the responsibility to collect the lessons and make sure they end up in the system." (Project Control Manager, POR_02)*

Other organisations have experimented with external facilitators to lead LL sessions, but participants questioned the sustainability of this approach, noting that external support does little to institutionalise practices internally. As PTS_02 remarked,

> *"It works for one project, but then the knowledge still doesn't stick in the organisation." (Contract Manager, PTS_02)*

The interviews reveal a consensus that ownership is central to embedding LL into governance. Without a clear role or dedicated function, LL risks remaining a procedural formality, disconnected from strategic learning. Structural solutions such as PMO integration or centralised knowledge managers were consistently cited as critical enablers for moving beyond compliance-driven routines toward a genuinely learning-oriented organisation.

5.2.6 Networks & Systems & Coordinators

At the intersection of networks, systems, and coordinators lies a paradox: Lessons Learned (LL) is almost universally recognised as valuable, yet it rarely secures sustained priority in practice. While project teams and managers acknowledge its strategic role, LL is often overshadowed by immediate delivery pressures, intangible outcomes, and ingrained work habits. The effectiveness of LL thus depends not only on structural processes or assigned roles, but also on cultural signals: whether organisations create urgency, invest in training, and reinforce behaviours that make reflection part of daily routines.

This section explores how value is attributed to LL and how cultural drivers shape its integration into organisational practice.

Value and Priority

Across all interviews, Lessons Learned (LL) was consistently recognised as a valuable practice, essential for improving organisational performance and reinforcing a culture of continuous learning. Some participants even framed LL as a core responsibility for knowledge-driven client organisations. Yet, despite this broad consensus, LL often struggles to gain traction in day-to-day practice.

A recurring behavioural pattern is that LL is treated as secondary to immediate project demands. While interviewees acknowledged its strategic importance, they described reflection as a "nice to have" that receives attention only after major issues arise.

> *"There is no sense of urgency… Everybody keeps doing the same things until something goes wrong. Only then lessons learned become important." (Contract Manager, RWS_01)*

> *"You see it after incidents… People start looking for lessons when it's already too late." (Project Manager, TNT_02)*

This reactive posture was also linked to ingrained work habits. Teams often begin new projects without consulting prior experiences, despite available systems or documentation:

> *"It's a bit of second nature that when you start something, you just start and see what happens, instead of taking time to look at lessons from similar projects." (Contract Manager, POR_01)*

> *"You can write it in the process, but if people don't take the time to use it, nothing changes. It's all about behaviour." (Project Control Manager, POR_02)*

Another barrier is the intangible nature of LL outcomes. Unlike cost, time, or quality, lessons are difficult to capture in measurable indicators, making them harder to prioritise in reporting or decision-making:

> *"No one can argue against lessons learned and that it is a good initiative… But for report meetings, they often focus on the things that they can measure and report on, and not so much the softer side of these things." (Contract Manager, PTS_02)*

> *"For these kinds of things, you have to make a business case… How much do we spend and what does it bring? That's the question." (Project Manager, TNT_02)*

These constraints are amplified under tight schedules and delivery pressure. When unexpected issues arise, LL often slips to the bottom of the priority list:

> *"You can evaluate what you want, but if the person who can implement it in the next project is not there, it doesn't help." (Project Manager, TNT_03)*

Finally, some participants highlighted that LL outcomes are incremental, producing benefits across multiple projects rather than within a single cycle:

> *"It's about small changes… they have less impact now, but the gain is in the long term." (Project Manager, POR_03)*

Taken together, these insights highlight a central paradox: LL is universally valued in principle, but its intangible, long-term nature leaves it vulnerable to short-term pressures and reactive application. Without incentives, ownership, and visible integration into organisational routines, LL risks being sidelined until crises make its absence too costly to ignore.

Cultural Drivers and Change

The organisational culture surrounding Lessons Learned (LL) strongly influences whether these practices are perceived as valuable or burdensome. Interviewees indicated that cultural signals from leadership—such as whether the organisation visibly invests in LL-related practices—have a significant effect on how seriously project teams engage with reflection and knowledge sharing.

In this context, training emerged as a recurrent theme. Participants from multiple organisations viewed the lack of training not just as a capacity gap, but as a signal that LL is not yet fully embedded in organisational routines. One respondent observed:

> *"They're definitely not good in training. That is something I'm missing really. If I compare that to Siemens, it's almost the opposite. They really invest a lot in people and in trainings and in technical knowledge." (Project Manager, TNT_02)*

The comparison with other companies, perceived to be more committed to continuous learning, reinforces the idea that internal culture shapes behavioural norms. According to TNT_02, improving LL requires more than updating processes; it requires shaping behaviour through structured interventions:

> *"You can change that by focusing on behaviour with all kinds of programmes… I think with lessons learned that can be the same. But that is not done. So it's now more process-driven, but there is a behaviour-driven part behind it." (Project Manager, TNT_02)*

At Port of Rotterdam, a more formal approach to training was reported. POR_02 described how the organisation's transition to a knowledge management cycle (KMC) began with mandatory training sessions for all employees, aimed at standardising procedures and fostering engagement:

> *"The guy made the whole company go on training. So first make a general standard—how do you deal with knowledge within your company? And then you have to of course train people with it. Explain them what kind of tools we have for it." (Project Control Manager, POR_02)*

This structured investment helped introduce a shared language and process for LL, yet even in these cases, cultural norms were seen as slow to evolve. One lingering issue is the reliance on tacit knowledge and the difficulty of surfacing it through documentation alone. As POR_02 put it:

> *"We say knowledge is not written down in books… it's written in people and in people's minds. You have to access people. That's where knowledge is." (Project Control Manager, POR_02)*

The findings suggest that LL systems cannot succeed on tools and processes alone. They must also address cultural and behavioural dimensions—through training, leadership engagement, and continuous reinforcement—to encourage both the expression and the uptake of shared learning.

5.2.7 Synthesis

This section brings together the main insights from the empirical findings to give a clear overview of how Lessons Learned (LL) practices are currently experienced in construction client organisations. The synthesis is designed to align with the earlier literature review, so that the two can later be systematically compared in the analysis chapter.

In contrast to the literature review, which treated dissemination and implementation as two separate phases, the findings have shown that interviewees rarely distinguished between the two in practice. Dissemination and implementation were often described together. To remain faithful to the empirical material, this synthesis therefore reports them as a single combined phase, while identification remains distinct.

The first table (Tab. 5) provides a synthesis of the key aspects emerging from the interviews. It highlights, for each LL phase, the technical/procedural elements and the behavioural/cultural dynamics described by participants. While technical structures such as repositories, templates, or project reviews are often in place, interviewees consistently reported that behavioural and cultural conditions determine whether these processes have any practical effect.

LL Phase	Technical/Procedural Aspects	Behavioural/Cultural Issues
Identification	- Often scheduled at project end, too late - Intermediate sessions rare, ad hoc - Evaluation formats range from informal talks to stage-gates - Documentation produced but ownership unclear	- Openness higher within teams, but declines with external parties - Reluctance to share in multi-party settings due to claims/reputation - Informal conversations (coffee, social events) more trusted than systems - Individuals' confidence and maturity shape willingness to share
Dissemination & Implementation	- Repositories and reports static, rarely consulted - Weak accountability: no clear follow-up roles - Dissemination depends on timing and targeting but poorly embedded - Standardisation vs flexibility tensions (templates, contracts) - Formal tools (e.g. PortWizard) exist but underused	- Knowledge transfer relies on networks, not systems - High dependence on individuals moving across projects - Lessons perceived as low-priority, dropped under time pressure - Trust and message relevance decisive for uptake - Cultural resistance to behaviour change; symbolic rather than applied - External collaboration constrained by competitive agendas

Tab. 5 Empirical Status Quo of LL [Author]

To deepen the empirical picture, the synthesis was expanded by identifying patterns of convergence and tension across both dimensions and phases. Two additional layers were added:

- Common Aspects: cross-cutting themes that consistently enable LL practices when present, such as informal networks, trust, or structured but flexible processes.

- Frictional Aspects: points of misalignment or conflict between the technical and behavioural dimensions, such as repositories that exist but are ignored, or formal requirements that clash with a culture of blame or fear of exposure.

These aspects were assessed both along the horizontal axis (within each phase) and the vertical axis (across the technical and behavioural dimensions). This dual perspective makes visible not only what supports LL in practice, but also where socio-technical misalignments persist and limit effectiveness. The results are presented in the extended synthesis table (Tab. 6).

LL Phase	Technical/Procedural Aspects	Behavioural/Cultural Issues		
Identification	- Often scheduled at project end, too late - Intermediate sessions rare, ad hoc - Evaluation formats range from informal talks to stage-gates - Documentation produced but ownership unclear	- Openness higher within teams, but declines with external parties - Reluctance to share in multi-party settings due to claims/reputation - Informal conversations (coffee, social events) more trusted than systems - Individuals' confidence and maturity shape willingness to share	- Identification usually occurs at closure - Openness depends on trust - Informal talks widely valued	- Late timing undermines usefulness - Fear of blame or reputational risk restricts candour
Dissemination & Implementation	- Repositories and reports static, rarely consulted - Weak accountability: no clear follow-up roles - Dissemination depends on timing and targeting but poorly embedded - Standardisation vs flexibility tensions (templates, contracts) - Formal tools (e.g. PortWizard) exist but underused	- Knowledge transfer relies on networks, not systems - High dependence on individuals moving across projects - Lessons perceived as low-priority, dropped under time pressure - Trust and message relevance decisive for uptake - Cultural resistance to behaviour change; symbolic rather than applied - External collaboration constrained by competitive agendas	- Systems exist but are weakly integrated - Dissemination and follow-up consistently fragile - Networks central everywhere	- Lack of ownership/action leaves lessons symbolic - Standardisation clashes with project dynamics - Cultural resistance blocks uptake
	- Formal structures exist (repositories, templates, stage-gates), but integration and accountability are missing across cases	- Trust, openness, and leadership consistently shape outcomes - Informal exchange central - Cultural readiness crucial	**Common Aspects**	
	- Processes overly rigid, late, or generic - Static documentation without ownership prevents reuse	- Fear of judgment, resistance to change, and reliance on individuals create fragility - Organisational culture prioritises delivery over reflection		**Frictional Aspects**

Tab. 6 Empirical Common and Friction Aspects of LL [Author]

The empirical synthesis underlines how LL practices are embedded in both structural procedures and everyday behavioural realities. While organisations share common enablers—such as valuing informal exchange and recognising the importance of trust—they also exhibit recurring frictions, especially where technical systems demand engagement that cultural norms or project pressures discourage. These socio-technical tensions provide the foundation for the upcoming analysis, where Structuration Theory will be applied to bridge the empirical findings with the theoretical insights from the literature review.

6 SOCIO-TECHNICAL FRAMEWORK

This chapter contributes to the development of general guidelines for improving Lessons Learned (LL) practices in client organisations. It does so in two steps. First, LL practices are analysed through the lens of Structuration Theory, using its three modalities to surface recurrent patterns and dynamics. Second, these analytical outputs are translated into visuals that form the basis of a framework. The framework is not intended as a ready-made or one-size-fits-all process, but as a set of general guidelines that highlight the key conditions and interactions shaping effective LL.

6.1 Structuration Analysis

The preceding chapters established three domains – networks, coordinators, and systems – as the principal arenas through which Lessons Learned (LL) are created, interpreted, and institutionalised in client organisations. Each of these domains captures a distinct layer of the LL process: networks as the everyday channels through which meaning is negotiated, coordinators as the actors who carry or curtail lessons, and systems as the formal artefacts designed to stabilise knowledge over time.

To explore how these domains shape LL, this chapter applies Structuration Theory. Giddens' three modalities – signification, domination, and legitimation – provide a lens for analysing how meaning is produced, how resources and authority are mobilised, and how norms and rules sustain or undermine practice. Rather than treating networks, coordinators, and systems as static categories, the analysis shows how they are reproduced dynamically through the interplay of these modalities.

6.1.1 Networks

In the client organisations studied, networks stood out as the primary medium through which Lessons Learned (LL) acquired meaning and relevance. When asked where they turned for insight, practitioners rarely mentioned repositories or templates first; instead, they pointed to colleagues, role communities, or project teams. These conversational ties shaped whether

experiences were understood, remembered, and reused. Applying Structuration Theory to networks helps explain why: meaning is constructed through interpretive schemes, resources may enable or constrain exchange, and cultural signals determine whether such sharing is valued or ignored. Yet the analysis also shows that networks are unevenly illuminated by the three modalities. Signification reveals rich patterns; domination plays a secondary, enabling role; and legitimation emerges mostly in the background, sustaining or undermining networked exchange.

The strongest empirical patterns appeared in how lessons travelled across different levels of networks. Respondents distinguished between small technical insights, best suited for peers in the same role, and broader reflections on collaboration, which resonated in project teams. Only a small set of lessons were seen as significant enough to warrant escalation into organisational standards. In structuration terms, these distinctions illustrate how interpretive schemes shape the meaning of LL: what counts as relevant knowledge depends on the forum. Over time, this repeated differentiation consolidated into recognisable categories of practice, giving rise to what we describe as **LL Channels**.

A related pattern emerged in how employees judged the reach of their insights. Some lessons remained personal, shaping only the way an individual approached their work. Others were shared among peers who performed similar tasks, while a smaller fraction were put forward in team or organisational settings. These everyday judgements were not based on formal rules but on actors' interpretations of relevance. Through structuration, this practice can be seen as the reproduction of cultural codes: deciding what to share and with whom reaffirms the boundary between "local" and "organisational" knowledge. This recurring practice becomes visible as **filtering and audience**.

Formal processes were also discussed, though often with ambivalence. Evaluations, templates, and stage-gates were acknowledged as necessary structures, but in many cases they produced documentation that quickly disappeared into archives. Some respondents described them as compliance routines with little practical effect. Yet when these same tools were embedded in networked conversations — for instance, when a template guided a role-based exchange — they gained value as scaffolding. The difference lay not in the process itself, but in how it was enacted: whether it reinforced interpretive schemes of LL as bureaucracy or as meaningful reflection. This dynamic crystallises into **processes not as solutions**, but as scaffolding.

Domination played a more limited but still visible role. Allocative resources such as repositories or IT platforms were often described as inert when

disconnected from networks. Documentation became useful only when linked back to people – a database pointing to an expert, or a system discussed in a meeting. This highlights the tension between resources and meaning: domination alone cannot sustain LL in networks; resources acquire power only when enacted through interpretive practices.

Legitimation shaped networks in more subtle ways. In some organisations, role-based meetings and communities of practice were formally endorsed, giving them normative weight as legitimate spaces for LL. In others, networks persisted informally but without institutional recognition. Feedback played a decisive role here: when contributions received acknowledgement and follow-up, actors felt that sharing was both valued and expected. When no response followed, engagement declined, and networks slipped into the background. In structuration terms, feedback combined authoritative resources with normative sanction, signalling whether LL in networks was consequential or symbolic. From this dynamic emerged the output of **feedback systems**.

Taken together, the analysis confirms that networks are the foundation of LL. They are the first arena where meaning is constructed, categories of learning are negotiated, and lessons are filtered into appropriate channels. Processes and resources only succeed when woven into these exchanges, and legitimacy determines whether networked sharing is sustained. From this analysis, four outputs crystallise: types of learning, filtering and audience relevance, processes as scaffolding, and feedback systems. They are not abstract categories applied in advance, but empirical patterns that surface when networks are examined through the modalities of structuration.

6.1.2 Coordinators

If networks are where lessons gain their first meaning, coordinators are the actors who decide whether those lessons continue their trajectory or fade into irrelevance. Across all four client organisations, interviews pointed to a recurring weakness: lessons were captured but rarely taken forward with clear responsibility. The role of coordinators – whether formal managers, project control staff, or respected opinion leaders – is central in shaping whether LL is reproduced as symbolic documentation or enacted as organisational practice. Applying Structuration Theory to this domain shows that coordinators are illuminated primarily through domination and legitimation, with signification playing a secondary role as coordinators interpret what qualifies as a lesson worth escalating.

The strongest empirical patterns emerged around the question of responsibility. Respondents consistently described the absence of clear

ownership as the reason why lessons failed to "stick." Project managers often carried the burden by default, but under pressure to close projects, they had little capacity to ensure continuity. In some cases, functions such as PMO or project control were tasked with capturing and curating lessons, but even there accountability for implementation was weak. In structuration terms, coordinators embody authoritative resources: they have the capacity to allocate responsibility and mobilise follow-up. When no actor assumes this role, lessons remain disconnected from authority, and LL is reproduced as symbolic capture. When ownership is clearly assigned, however, lessons gain a pathway to enter governance cycles and become consequential. This dynamic crystallises into the output of **ownership and accountability**.

Yet ownership alone is not enough to make lessons authoritative. For lessons to carry weight, they must also be validated. Interviews frequently returned to the idea that "a lesson is not a lesson until someone signs off on it." Validation functions as a checkpoint: it tests the relevance of a lesson, filters out noise, and confers organisational approval. Without it, lessons risk remaining personal anecdotes; with it, they are elevated to recognised knowledge. But validation does not occur automatically. It requires someone to be accountable for carrying it out and for ensuring follow-up, once again linking back to the need for ownership. Through structuration, this represents the intersection of domination and legitimation: authoritative resources assign responsibility for validation, while normative recognition gives validated lessons their weight. From this interplay emerges the output of **lesson validation**.

Taken together, the analysis shows that coordinators are pivotal to the LL process because they prevent lessons from stagnating as symbolic records. They do so by assuming ownership and accountability, mobilising authoritative resources to ensure lessons are carried forward, and by validating lessons, which gives them legitimacy and durability. Without these functions, LL collapses into capture without consequence; with them, lessons are translated into knowledge that organisations can stand behind.

6.1.3 Systems

Systems are the most formalised element of Lessons Learned (LL) practices. Stage-gates, repositories, templates, and sign-off procedures were present in all four client organisations, representing the organisation's attempt to stabilise and institutionalise knowledge. Applying Structuration Theory to this domain shows that systems are illuminated differently through each modality. Signification reveals how systems shape the meaning of LL, domination highlights the role of authority in making them enabling or constraining, and

legitimation clarifies how some lessons are institutionalised as rules while others remain local practices.

From the perspective of signification, systems often struggled to convey meaningful purpose. Interviewees described repositories as "final stops" or "drawers," where lessons were filed but rarely revisited. Templates and evaluations, too, were experienced as administrative obligations when disconnected from practice. In such cases, the interpretive scheme of LL shifted: instead of being understood as a reflective process, LL was re-signified as bureaucracy. Yet the same tools could carry very different meanings when embedded in conversations. When repositories recorded the outcome of team exchanges, pointed to named experts, or specified conditions of applicability, they reinforced rather than replaced sense-making. Here, systems became scaffolding for interpretation, providing durable artefacts that extended conversations into the future. Through signification, then, we see the emergence of **supporting systems**: repositories and templates that reinforce meaning only when coupled with networks, but that hollow it out when treated as standalone ends.

Domination sharpened the contrast between enabling and constraining systems. Across the cases, mandatory evaluations and stage-gates were common, but their effects diverged depending on how authority was exercised. Where requirements were imposed without time, explanation, or follow-up, actors complied minimally: boxes were ticked, but little learning occurred. LL was reproduced as a symbolic activity because authoritative resources were mobilised as control, detached from purpose. By contrast, where managers allocated time, explained objectives, and periodically validated and disseminated lessons, authority resourced practice rather than hollowing it out. Port of Rotterdam's quarterly cycle illustrated this generative form of domination: project-level lessons were visibly integrated into organisational artefacts, and participation gained credibility. From this lens, **top-down systems** emerge as a double-edged output: authority can either empower allocative resources to shape conduct or reduce them to rituals of compliance.

Legitimation, finally, determined whether systems translated lessons into durable organisational routines. When lessons were validated as broadly relevant, they were codified into standards, checklists, or governance procedures, becoming legitimate rules of conduct. In this way, lessons moved from temporary project artefacts to institutionalised expectations that shaped future behaviour. Yet many lessons remained local, never validated beyond the team or role level. These did not vanish; they continued to influence everyday practices by shaping how actors interpreted situations (signification) and how resources were mobilised in projects (domination). But without

formal validation, they lacked normative weight. This uneven institutionalisation crystallises into the output of **practices and routines**: some lessons acquire legitimacy as binding organisational norms, while others remain embedded as informal practices.

A further mechanism of legitimation emerged through **organisational trainings**. Training created the conditions in which LL was not only understood but recognised as an expected and valued practice. By introducing a common language, aligning procedures, and signalling managerial commitment, training embedded LL into the normative fabric of organisations. Employees were not just taught how to record lessons but also why reflection and sharing mattered. Research confirms this legitimising effect: meta-analytic evidence shows that well-designed training reliably improves individual performance and, when supported by the work environment, extends benefits to teams and organisations (Aguinis & Kraiger, 2009). From a cultural perspective, training functions as what (Schein, [2010] calls a primary embedding mechanism — it legitimises "the new way of working" by making expectations explicit and providing psychological safety for change. In structuration terms, training acts as a positive sanction: it socialises employees into a normative order where engaging with LL is "the right thing to do."

Taken together, systems illuminate how structuration modalities interact in the most formalised layer of LL. Through signification, systems can reinforce meaning or reduce it to bureaucracy. Through domination, they can resource practice or demand hollow compliance. And through legitimation, they can transform lessons into durable routines, while training acts as the cultural hinge that embeds LL as an organisational expectation. The outputs are not abstract categories applied in advance but empirical patterns that emerge when systems are examined through the modalities of structuration.

6.1.4 Summary

The structuration analysis shows that the three domains illuminate different facets of how LL is reproduced in organisations. Networks are the foundation: they give meaning to lessons through interpretive schemes, filter knowledge into appropriate channels, and rely on feedback for legitimacy. Coordinators act as carriers of authority: by taking ownership and validating lessons, they determine whether insights remain symbolic or gain organisational weight. Systems provide the most formalised structures: they can reinforce meaning when coupled to conversations, empower learning when authority is enabling, and institutionalise lessons when validation turns practices into routines.

The interplay of modalities explains why LL so often stalls. Signification alone can generate meaning in networks but cannot sustain it without feedback and

recognition. Domination can mobilise authority, but unless it is exercised to resource practice, it collapses into compliance. Legitimation can codify lessons into routines, but only if ownership and validation are present. The analysis thus clarifies why LL must be understood as a socio-technical system: none of the domains can function in isolation, and none of the modalities is sufficient on its own.

The visual below (Fig. 14) summarises the findings. Each domain is shown alongside the structuration modalities, with the outputs positioned where they most strongly emerged. Some sit squarely under one modality, while others span boundaries, reflecting the overlaps observed in practice. Together, the diagram provides a structured view of how networks, coordinators, and systems interact with signification, domination, and legitimation to shape the fate of lessons learned.

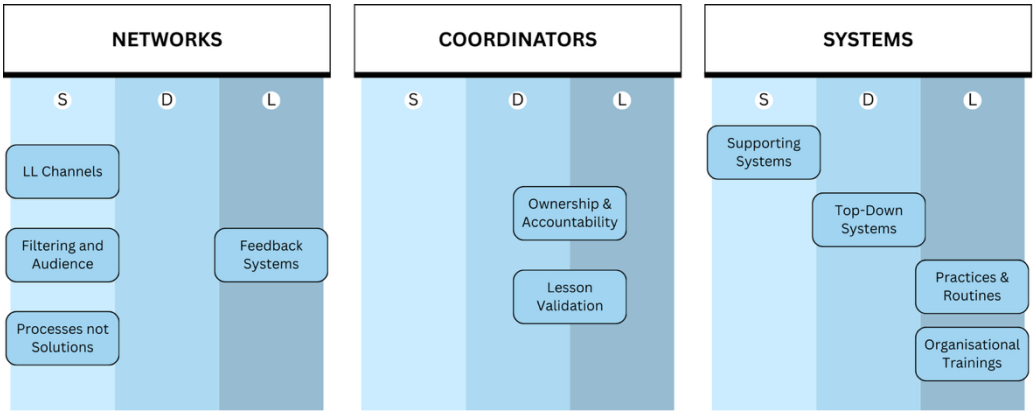


Fig. 14 Structuration Outputs [Author]

6.2 General Guidelines: Framework

The structuration analysis showed how networks, coordinators, and systems shape Lessons Learned (LL) through signification, domination, and legitimation. From this, key outputs emerged.

This chapter translates those insights into a framework of general guidelines. Rather than prescribing a rigid procedure, the framework integrates technical processes, behavioural dynamics, and cultural conditions into a model that organisations can adapt to their own context. The following sections first introduce the foundational elements and then present the framework in its entirety.

6.2.1 Setting the foundations

This chapter presents the framework developed as the central output of this research. Built upon the integrated insights of both the empirical and theoretical investigations, and interpreted through the lens of Structuration Theory, the framework serves as a comprehensive yet adaptable model for improving Lessons Learned (LL) practices within construction client organisations. Rather than prescribing a fixed sequence of actions, the framework consolidates key dynamics and conditions, both technical and behavioural, that were found to shape LL effectiveness.

The structure of the chapter mirrors the layered build-up of the framework itself. Each subsection unpacks a critical design choice or foundational element, showing how it emerged from the research and how it contributes to the overall logic.
Ultimately, this framework is intended not as an off-the-shelf solution, but as a scaffold for reflection and improvement, one that supports organisations in aligning their LL strategies with their structure, culture, and operational realities.

LL Channels

The framework distinguishes between project, role-based, and personal learning, as identified in the empirical analysis. Lessons differ in scope and relevance, requiring tailored channels: role-based insights are best shared within professional groups, while broader reflections suit cross-functional teams. This logic informed the horizontal structure of the framework, where a filtering system directs lessons to the appropriate learning path. While these channels often overlap in practice, the framework visualises them separately to reinforce the need for context-matching in knowledge sharing.

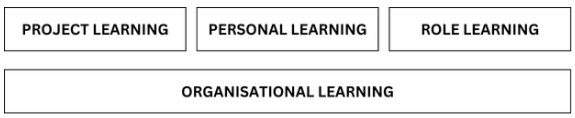


Fig. 15 LL Channels – Framework [Author]

The above explained channels are also translated into visuals, to ensure framework completeness.

Project-Leve Evaluation Moments
Stage-gate project management structures proved effective for LL across the cases. While the specific format of the gates may vary (e.g., based on phases, milestones, or fixed review points), what matters is that evaluations are embedded as recurring touchpoints. These should include not only formal

gates but also allow for dynamic reflection points when significant issues or opportunities arise. In this way, LL becomes responsive rather than retrospective.

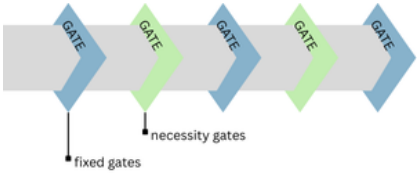


Fig. 16 Stage-Gate - Framework [Author]

Technical Exchange through Role Meetings

At the technical level, frequent role-based meetings remain the most effective setting to exchange specialised insights. When these are too infrequent or informal, behavioural barriers such as ego or isolation may interfere with knowledge sharing. Regular, inclusive role meetings help ensure that expertise is transferred beyond individuals and becomes available to the broader organisation.

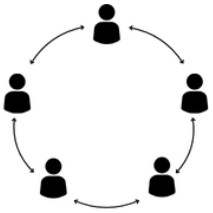


Fig. 17 Role-Based Meetings – Framework [Author]

Filtering and Audience Relevance

Not all lessons hold the same weight or require the same reach. Interviews made clear that employees already filter lessons naturally—some remain personal, others are role-based, and only a few warrant organisation-wide attention. This filtering is not a flaw but a vital function that enhances lesson relevance and prevents overload.

To support this practice, the framework introduces filtering moments at three key stages:

1. When a lesson is first identified.
2. During role or team meetings.
3. When escalation to the organisation is considered.

Rather than enforcing one-size-fits-all dissemination, the system empowers employees and coordinators to judge what to share, with whom, and through which channel. This selectivity strengthens the signal of what matters, improving both engagement and impact.

Fig. 18 Filtering System – Framework [Author]

Processes not Solutions

While the framework visually resembles a process, it should not be mistaken for a fixed procedure. The analysis showed clearly that processes alone do not enable learning: without follow-up, ownership, and cultural support, they become symbolic or ignored. This framework is therefore intended as a flexible guideline—a structured overview of key elements to consider, not a one-size-fits-all solution. As will be addressed in the next chapter, its value lies in being tailored to each organisation's needs through formal and informal mapping and ideally embedded within training and leadership efforts. The framework's strength is not in prescribing steps, but in helping client organisations align structure with reflection, behaviour, and meaning.

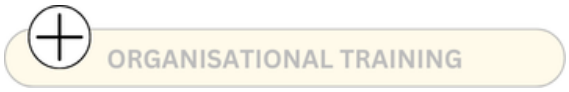


Fig. 19 Coupling Process and Trainings – Framework [Author]

Feedback Systems

Feedback mechanisms are the silent enabler of Lessons Learned (LL). Without visible follow-up, contributors disengage, regardless of how motivated they initially were. Across all client organisations, the absence of feedback loops emerged as a key reason why LL practices often stall at identification. Conversely, where periodic validation and communication exist, lessons are more likely to translate into change.

The framework does not prescribe exact formats or timing, but it emphasises that every action (whether evaluation, governance escalation, or implementation), should be paired with a feedback signal. This ensures that contributors are informed, feel acknowledged, and remain engaged.

In short, feedback sustains the LL cycle. It makes lessons consequential, reinforces legitimacy, and turns one-off contributions into shared organisational progress.

Fig. 20 Feedback System – Framework [Author]

Ownership and Accountability

Clear ownership and accountability are critical enablers of effective LL, yet are often missing or not clearly appointed in practice. The framework integrates this element not by prescribing a fixed role, but by emphasising that the right owner should reflect the organisation's internal dynamics (whether a project controller, PMO, or credible opinion leader). What's essential is not hierarchy, but accessibility and legitimacy.

This person should be publicly known within the team or organisation and act as a reference point; Someone who encourages network connections, validates the value of lessons, and helps route them into governance systems. While technical depth isn't required, interpersonal trust and a proactive attitude are.

The framework, therefore, represents ownership as a key resource to bridge learning and implementation. Without it, lessons risk fading into symbolic records; with it, they gain the authority and momentum to impact future practice.

Fig. 21 Ownership & Accountability – Framework [Author]

Lesson Validation

To ensure that identified lessons result in action, the framework incorporates a validation cycle consisting of:

Fig. 22 Evaluation / Validation of Lessons - Framework [Author]

This structure formalises the after-action logic frequently raised in interviews and literature alike. The aim is not to prescribe a rigid process, but to illustrate key steps that should be present in any serious effort to institutionalise LL.

Supporting Systems

Although repositories are often seen as ineffective, the framework retains them as essential support elements, not as drivers of learning per se, but as enablers of knowledge memory and traceability. Evidence showed they are

rarely consulted during projects, yet still serve important roles when embedded in governance cycles and linked to ownership and feedback loops.
In the framework, supporting systems are intentionally positioned in the background: available across learning types but never obstructing interaction. Their role is to stabilise insights after sense-making has occurred, not to replace it. When repositories are used to document validated, contextualised lessons – ideally tied to action plans or standards – they reinforce learning rather than dilute it.

This setup also anticipates AI-enabled retrieval and filtering, which can reduce search friction and boost relevance. However, such tools only gain value when governed by clear decision structures. Supporting systems therefore remain a quiet but necessary layer in a functioning LL ecosystem.

Fig. 23 Supporting Systems – Framework [Author]

Top-Down Systems

Top-down structures are not inherently problematic; On the contrary, they are necessary. The key is how they are exercised. Mandates become meaningful when clearly defined in time (e.g. fixed quarterly cycles like Port of Rotterdam) and visibly lead to action. When done well, they function as "organisational stage gates" that validate lessons, update standards, and close the feedback loop, enhancing transparency and employee engagement.

Importantly, there is no one-size-fits-all frequency or format. Some organisations may prefer strict cycles; others benefit from more flexibility. What matters is that rules are matched with resources—time, training, and purpose—and that decisions are shaped with, not just for, the people doing the work.

In the framework, these dynamics are embedded in the feedback system, where top-down action serves as an enabler rather than a barrier to learning.

Fig. 24 Top-Down Systems – Framework [Author]

Practices & Routines

Finally, the framework distinguishes between lessons that inform local working practices (e.g., technical methods or project-specific workflows) and those that influence organisational routines (e.g., formalised standards, procedures, services, or products). The latter are escalated for institutional integration; the former remain actionable at team or individual level.

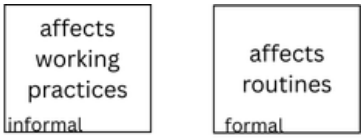


Fig. 25 LL Effects – Framework [Author]

Organisational Trainings

Training is not a step in the LL process: it is a foundational condition. While not part of the framework's procedural flow, it is visually represented to show that the framework should always be coupled with structured training efforts.
Training legitimises LL by aligning behaviours with organisational expectations. It gives employees a shared language, makes the relevance of LL explicit, and signals that the organisation supports and values reflection and sharing. Port of Rotterdam's experience showed how training created common understanding and helped institutionalise LL.

In short: training makes LL culturally sustainable. The framework alone cannot shift behaviour—training is what allows its logic to be enacted.

Fig. 26 Organisational Training – Framework [Author]

6.2.2 The framework

All the elements discussed in the previous sections contribute to the design of the framework presented below. Rather than offering a fixed procedure, the framework brings together the most relevant insights, dynamics, and requirements that emerged from the research. Its goal is to serve as a structured yet flexible guiding model for client organisations to reflect on, assess, and improve their Lessons Learned practices.

The framework aligns with both empirical evidence and theoretical understanding, particularly Giddens' Structuration Theory, by addressing the

interaction between formal processes, behavioural dynamics, and cultural legitimisation. It is intended to be used in combination with a deeper understanding of the organisation's context – such as through formal and informal mapping – and not as a standalone tool.

The following visual captures the framework in its entirety:

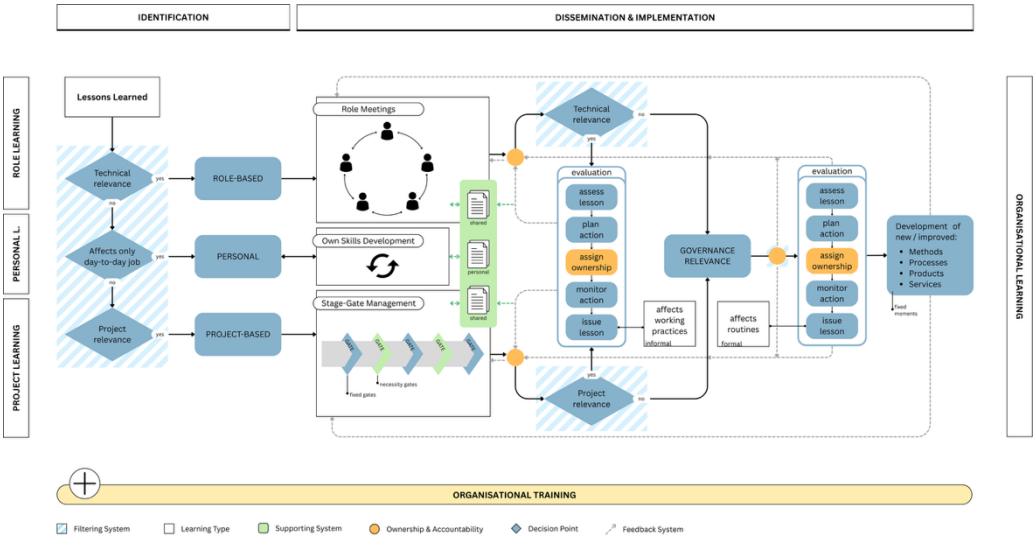


Fig. 27 LL General Guidelines – Framework [Author]

A larger version of this framework visual is provided in the Appendix (Appendix 2) for clarity and reference.

7 ORGANISATIONAL CONTEXT

This chapter examines the organisational context of Lessons Learned (LL) practices across the four client organisations studied. While the previous chapters developed general guidelines and an integrated framework through thematic analysis and Structuration Theory, this chapter shifts the focus to the specific organisational arrangements and lived realities of LL. The aim is to understand both how LL is formally structured within organisations, and how these structures are actually reproduced, challenged, or adapted in everyday practice. To do so, the chapter applies the first two steps of the five-step approach introduced earlier: formal mapping, which captures official systems, roles, and procedures, and informal mapping, which surfaces the behavioural, cultural, and relational dynamics that influence how lessons are truly shared and applied. By examining both perspectives in parallel, this chapter lays the empirical foundation for identifying gaps between design and practice, which will later guide tailored recommendations.

7.1 Formal Mapping

The first part of this chapter presents the formal mapping of LL practices. This step provides a comparative overview of how client organisations formally arrange their networks, coordinators, and systems for capturing and transferring lessons. The analysis is based on interview data but focuses on the descriptions of official structures and procedures rather than interpretations. By structuring the findings under the three domains, the formal mapping highlights similarities and differences across the four cases in a clear and comparable way. Table 5 consolidates these observations, offering a concise overview of formal LL practices that serves as a factual reference point. The purpose here is descriptive: to establish how LL is supposed to function in each organisation before turning to how it is experienced in practice.

7.1.1 Port of Rotterdam

As one of the largest infrastructure clients in the Netherlands, Port of Rotterdam has developed relatively mature and structured lessons learned practices. Its approach balances formal systems with human interaction,

aiming to ensure that knowledge remains both accessible and actionable across projects.

Networks

Port of Rotterdam's formal approach to knowledge management deliberately combines structured systems with human connections. The central tool, Port Wizard, is not designed as a passive repository but as an active directory that points employees towards key knowledge holders. Rather than accumulating lengthy reports that are rarely revisited, the system provides concise procedural summaries and identifies experts who can contextualise lessons. This reflects the organisation's belief that "knowledge is in people's minds," and that access to the right individual is more valuable than static documentation. In this way, formal networks are embedded into the system, reinforcing collaboration and enabling knowledge to flow smoothly across projects and departments.

Coordinators

Responsibility for lessons learned (LL) is clearly structured and distributed. Project controllers hold a central coordinating role, initiating evaluations, guiding discussions, and ensuring documentation is properly managed. Subject-matter specialists, designated as knowledge holders, maintain their dedicated areas within Port Wizard and serve as the first points of contact for colleagues seeking expertise. These coordinators not only safeguard the quality of knowledge entries but also help bridge gaps between project teams and organisational standards. While project managers retain ultimate accountability, the deliberate allocation of ownership across roles ensures that lessons are both captured and acted upon, reducing the risk of diffusion or neglect over time.

Systems

Formally, LL is embedded into project plans through explicit sections that identify required knowledge, acquisition methods, and evaluation mechanisms. The emphasis is on generating action-oriented recommendations that are specific, practical, and capable of being implemented, rather than compiling generic "lists of lessons." These outputs are systematically integrated into updated procedures, templates, and work instructions, which are reviewed and adjusted on a quarterly cycle to avoid disruption. Evaluations occur both at stage gates and in response to emerging issues, with a distinction between internal sessions – where openness is encouraged – end external sessions with contractors, which are shaped by commercial sensitivities. Dissemination is structured to balance efficiency and

accessibility, avoiding repository overload while ensuring consistent alignment across projects.

7.1.2 TenneT

TenneT, the national electricity transmission operator, has established formal expectations around lessons learned but struggles with consistency in execution. While systems exist on paper, in practice interpersonal communication often substitutes for structured reuse, leading to gaps between policy and application.

Networks

Although TenneT maintains formal records of lessons learned, interpersonal networks remain the dominant channel for knowledge transfer. Many employees rely on conversations, established professional relationships, or direct contact with colleagues rather than consulting spreadsheets or databases. This preference reflects a lack of confidence in the accessibility and usability of formal repositories, which are often viewed as cumbersome. As a result, while knowledge can circulate effectively within familiar groups, it risks remaining localised and failing to spread across the wider organisation.

Coordinators

Formal coordination of LL activities is weak. Quality managers or other support staff typically initiate sessions, but their role rarely extends to ensuring systematic follow-up or implementation. Responsibility for acting on lessons often dissipates once sessions conclude, leaving improvements dependent on the initiative of individual project teams. Interviewees highlighted the need for a dedicated LL coordinator who could safeguard continuity, encourage application, and monitor outcomes. In the absence of such a role, the presence of a receiving team member during sessions often determines whether lessons are actually transferred, making outcomes uneven and person-dependent.

Systems

TenneT's formal system is largely based on documentation in spreadsheets or databases, but these tools are difficult to access and rarely consulted after completion. Integration into project processes varies significantly: some projects embed LL as a recurring step in phase reviews, while others restrict it to closure. Timing is often problematic—sessions are frequently scheduled too late, after key staff have left the project, reducing the value of insights. Even when lessons are recorded, there is no central mechanism for ensuring their

reuse across the organisation. In long-term programmes, continuity naturally supports reuse, but in one-off projects, lessons remain siloed within the originating team. The reliance on lengthy Excel files further discourages engagement, limiting the system's practical impact.

7.1.3 Porthos

Porthos, a joint venture focused on carbon capture and storage, recognises the importance of lessons learned but has yet to establish a centralised or consistent system. Current practices rely heavily on individual initiative, with knowledge transfer often occurring within personal or role-based networks rather than through formalised structures.

Networks

Knowledge exchange at Porthos is primarily carried by informal and role-based networks. Contract managers, project leads, and technical specialists often share insights directly with their peers, but these exchanges rarely extend beyond immediate professional circles. Lessons are more likely to move horizontally (e.g. contract manager to contract manager) than vertically or across disciplines. While this creates a degree of trust and efficiency within roles, it limits broader organisational learning. The lack of a central platform means that valuable knowledge remains fragmented, tied to individuals rather than embedded within the organisation.

Coordinators

There is no formally designated coordinator for LL activities within Porthos. The initiation of lessons learned sessions typically depends on the awareness or motivation of project or contract managers, who may choose to organise reflections at handovers or closures. Because follow-up responsibilities are not clearly assigned, implementation is uneven and often short-lived. While interviewees acknowledged the potential benefit of appointing a dedicated LL role, concerns were raised regarding workload and the prioritisation of resources. As a result, coordination remains ad hoc, and the continuity of lessons depends on temporary leadership rather than sustained institutional support.

Systems

Formal systems for LL are limited and inconsistent. In some cases, sessions are included after partial handovers, offering opportunities to improve subsequent phases, but these practices are not standardised or embedded across projects. More often, LL is treated as a contractual or procedural

requirement rather than a mechanism for continuous improvement. Documentation is occasionally stored in registers, but dissemination is weak and largely confined to the originating team. Without a centralised mechanism to capture, review, and redistribute insights, lessons tend to remain isolated. The project-based nature of Porthos exacerbates this challenge, as teams often disband before knowledge can be institutionalised.

7.1.4 Rijkswaterstaat

It should be noted that, for Rijkswaterstaat (RWS), only one interview could be conducted. While this provided valuable insights, the findings should be interpreted with caution, as they represent a more limited empirical basis compared to the other organisations. Nonetheless, the evidence highlights a mix of formal systems and informal practices, with clear challenges in embedding lessons learned consistently.

Networks

RWS formally supports knowledge exchange through a centralised online portal designed as an interactive platform where employees can post questions and seek input from colleagues. This system reflects a shift away from static repositories toward a more networked model of learning. However, uptake depends strongly on individual initiative, and the platform is rarely consulted proactively. In practice, knowledge continues to flow mainly through personal networks and the mobility of staff between projects. These informal ties allow practical solutions to circulate, but they remain uneven and dependent on individual engagement rather than a stable organisational process.

Coordinators

Responsibility for lessons learned is fragmented across departments. Certain units are tasked with collecting and disseminating knowledge, but there is no dedicated LL role embedded within project teams. Instead, responsibility often defaults to departmental team leaders, whose engagement varies significantly. Without clear ownership, knowledge transfer depends heavily on whether individuals attend relevant meetings or make the effort to access available resources. Proposals to appoint dedicated LL coordinators within projects have been raised but face resistance, mainly due to concerns about cost and the added complexity of creating new roles. This leaves coordination patchy and dependent on existing workloads rather than institutional mandate.

Systems

Formal LL processes are not systematically embedded across all projects. While certain initiatives—such as team-building sessions with contractors—offer opportunities for reflection, follow-up on identified improvements is inconsistent. Project-level adjustments are often documented when contracts or technical requirements change, but broader lessons on collaboration or working methods rarely make it into accessible organisational records. Timing is another challenge: lessons are typically addressed reactively, once problems arise, rather than as part of a continuous practice. Attempts to conduct inter-project meetings exist, but attendance is irregular and often restricted by location or competing priorities. The online portal and other central systems contain potentially useful information, yet limited engagement and weak dissemination mean that much of it remains overlooked. Without regular prompts or targeted integration into templates and procedures, lessons risk being captured but not institutionalised.

7.1.5 Summary

To summarise the empirical observations, the formal mapping consolidates information from the four client organisations across the three domains of networks, coordinators, and systems. The consolidated findings are presented in Table 7, which provides an overview of formal lessons learned practices structured according to these domains. The overview presents, in a concise and comparable form, the practices described by interviewees and the ways these practices are formally arranged within organisations. By aligning the findings to the same three domains, the comparison highlights differences and similarities across cases while remaining within the descriptive scope of this chapter. Interpretations of these observations and their implications for improvement will be addressed in the subsequent analysis.

Domain	Port of Rotterdam	TenneT	Porthos	Rijkswaterstaat
Networks	- Port Wizard links staff to subject-matter experts - Knowledge framed as "in people's minds" - Formal networks reinforce collaboration across projects.	- Interpersonal ties and direct communication dominate over formal repositories - Reliance on personal trust limits wider dissemination	- Informal, role-based exchanges dominate - No central platform - Knowledge remains fragmented	- Online portal designed as interactive platform - Rarely consulted proactively - Reliance on personal networks and staff mobility for knowledge flow
Coordinators	- Project controllers coordinate evaluations - Subject-matter specialists maintain knowledge areas - Project managers hold ultimate accountability	- Quality managers or support staff initiate sessions but lack mandate for follow-up - Absence of a dedicated LL role - Transfer often depends on presence of receiving team members	- No designated LL coordinator - Responsibility left to project/contract managers - Follow-up ad hoc and dependent on individual initiative	- Responsibility fragmented across departments - No project-level LL roles - Proposals for dedicated coordinators face cost resistance
Systems	- LL embedded in project plans - Action-oriented recommendations feed quarterly updates to procedures/templates - Evaluations at stage gates and ad-hoc issues	- Lessons recorded in spreadsheets/databases but rarely reused - Integration inconsistent across projects - Sessions often too late - One-off projects silo lessons	- LL occasionally included after partial handovers - Mostly treated as contractual requirement - Registers used inconsistently - Dissemination largely confined to originating teams	- LL not systematically embedded - Reflections occur reactively - Some team-building sessions with contractors - Portal underused - Lessons rarely integrated into templates

Tab. 7 Formal Mapping [Author]

7.2 Informal Mapping

The second part of this chapter moves from formal description to informal practice. Whereas the formal mapping outlined the official structures and expectations, the informal mapping focuses on how LL is perceived and enacted by employees in their day-to-day work. This step draws attention to networks of trust, informal coordinators, and emergent systems of reflection that either reinforce or undermine the formal arrangements. Organised again under the domains of networks, coordinators, and systems, the findings reveal the cultural, behavioural, and relational factors that shape whether lessons are actually learned and reused. Table X consolidates these insights by contrasting formal procedures with informal perceptions, thus making visible the passage between organisational intent and lived practice. These insights are crucial for assessing the legitimacy of LL systems and provide the groundwork for the interpretive analysis that follows.

7.2.1 Port of Rotterdam

While Port of Rotterdam stands out for its structured Lessons Learned (LL) system, the informal dynamics captured in the interviews reveal a more nuanced and layered reality. This informal mapping aims to surface the lived practices, social undercurrents, and tacit norms that shape how LL is reproduced beyond formal processes. By contrasting interviewees' attitudes, behaviours, and relational patterns with the formal structures described earlier, this section provides insight into the socio-technical interplay that supports or constrains LL in practice.

Networks

Learning practices rely on people, not just systems

Although Port Wizard is often mentioned as a central technical repository, interviewees consistently emphasised that "knowledge is in people's minds" (POR_01; POR_02). Lessons are typically accessed by contacting known experts directly—often senior employees with long-standing tenure—rather than browsing documentation. The organisational knowledge network is thus deeply person-dependent, sustained through informal advice chains, spontaneous consultations, and habitual interactions. Several interviewees highlighted how trust and personal relationships determine whether and how lessons are shared. When a question arises, the first instinct is often to call a colleague rather than search a database. This behaviour reinforces the significance of informal networks as the primary vehicle for knowledge transfer.

Coordinators

Behavioural reinforcement and psychological safety

The cultural environment within Port of Rotterdam is generally perceived as open and psychologically safe. Interviewees spoke of mutual trust within teams, the ability to admit mistakes, and the freedom to ask questions. This climate encourages spontaneous learning moments and reflection, especially in role-based communities. For example, biweekly role-specific meetings (e.g., among contract managers) provide a semi-formal yet trust-rich setting where lessons are freely exchanged. Senior employees are seen as approachable "encyclopedias" of experience, and ego-based barriers to sharing seem limited—especially in long-standing teams. This reinforces informal legitimacy: LL is not just an obligation, but a socially reinforced norm.

Systems

Timing and initiative: self-triggered reflection

Unlike formal evaluation cycles, which follow predefined project stages, informal reflection tends to be triggered when tensions arise (e.g., when trust falters or collaboration deteriorates). In such cases, team members initiate spontaneous alignment sessions to restore cooperation, rather than waiting for official moments. These improvised touchpoints—including informal gatherings like Friday drinks or site barbecues—play a surprisingly strong role in rebuilding relational foundations for learning. They represent an emergent scaffolding for LL: not explicitly mandated, but perceived as crucial to maintaining a reflective culture.

Informal bottlenecks and risks

Despite the overall strength of informal learning mechanisms, interviewees expressed concern that much of the knowledge still resides with a few senior individuals. Their role as knowledge brokers is central, but also fragile. Some are retired or nearing retirement, and their insights are not systematically captured. This creates a latent vulnerability: the organisation's learning capacity may suffer if these relational nodes disappear. Moreover, while informal learning thrives in stable teams, increasing fragmentation across projects, where staff frequently shift roles or teams, can erode network cohesion and reduce LL's effectiveness.

7.2.2 TenneT

While TenneT has made notable progress in formalising project procedures and introducing a structured lessons learned (LL) process, the informal mapping reveals a more fragmented picture. Although repeated project formats offer an opportunity for procedural standardisation, this has

inadvertently clashed with the more adaptive and experiential side of LL practices. The resulting ambiguity appears to hinder both engagement and the perceived value of LL activities.

Networks

Perception and attitudes towards lessons learned

Interviewees across different roles expressed a mixture of mild frustration and disengagement toward LL practices. Despite acknowledging their importance, LL is often perceived as a formality—something that is "ticked off" rather than embraced as a tool for improvement. Participants noted that LL tends to be conducted too late, sometimes after key team members have exited the project, reducing both the quality of reflection and its practical value.

In contrast to organisations that embed LL in continuous dialogue, TenneT's employees described a general sense of disconnection between the intended purpose of LL and its actual implementation. The inconsistency across projects reinforced the impression that LL is more symbolic than effective.

Interpersonal networks and knowledge sharing

Despite procedural limitations, several interviewees emphasised the role of informal networks in facilitating learning. Knowledge is often shared through personal relationships, department meetings, or one-on-one exchanges between colleagues occupying similar roles (e.g., planners, contract managers). However, with the ongoing organisational restructuring at TenneT, these informal networks risk being disrupted. The shift from matrix-based to vertical team structures might weaken horizontal knowledge sharing across disciplines—especially within specialised roles like contract management.

Interestingly, some staff continue to rely on seasoned professionals with more project experience, suggesting that "grey hairs" still carry an informal authority and attract knowledge-seeking behaviour. This bottom-up learning, however, is highly dependent on individual initiative and not institutionally supported.

Coordinators

Ownership and responsibility

Although quality managers or project controllers are often tasked with coordinating LL activities, interviewees clearly pointed to a lack of ownership across the board. Project managers are technically responsible but often deprioritise LL due to time pressure or lack of perceived value. This diffusion of responsibility was consistently flagged as a root cause for the weak follow-through. Moreover, there is a notable absence of a central figure or body that actively facilitates knowledge transfer between projects. This gap has led to

both a lack of coordination and unclear expectations around who should ensure lessons are actually learned and reused.

Trust and strategic behaviour

While internal LL sessions tend to foster more honest exchanges, sessions with external stakeholders (e.g., contractors or subcontractors) were often described as strategically curated, with limited transparency. Employees remain cautious when sharing lessons that might expose internal weaknesses or sensitive issues. This strategic behaviour significantly limits the depth of collective learning and dilutes the potential value of external collaborations. Even within internal teams, interviewees noted that LL tends to focus disproportionately on negative outcomes, leaving successful practices underexplored and underreported. This contributes to a defensive rather than generative culture of reflection.

Behavioural barriers and motivation

The behavioural resistance to LL practices is rooted in both individual and organisational dynamics. Many employees see LL as disconnected from their own performance or success, especially when project results are satisfactory. This undermines the intrinsic motivation to reflect and share. Furthermore, the absence of structured feedback loops—whereby employees see their contributions implemented—erodes engagement further. Notably, some participants suggested that for behavioural change to occur, organisations must treat LL as a long-term investment, akin to safety culture programmes. Without this mindset shift and dedicated training initiatives, LL will continue to be marginalised as a procedural burden.

Systems

Relevance and applicability of lessons

TenneT's project environment is highly repetitive, which—paradoxically—both enables and undermines LL uptake. On one hand, the recurrence of similar project types offers a fertile ground for procedural refinement; on the other, staff often question the relevance of lessons from previous projects, especially when there are shifts in team composition, contract types, or contextual conditions. This challenge is compounded by the absence of mechanisms to tailor and contextualise LL from one project to the next. Several respondents suggested that incoming project teams should proactively engage with the previous teams to contextualise and interpret past lessons. However, this interaction rarely occurs, and when it does, it is usually informal and role-specific rather than embedded in broader project workflows.

7.2.3 Porthos

Despite being a joint venture project with increased collaboration among partners, Porthos presents a fundamentally different organisational environment compared to the other studied clients. The nature of the project (one-off, multi-party, and largely temporary) deeply shapes how Lessons Learned (LL) practices are perceived and enacted. While the formal mapping showed some moments of reflection and ad hoc responsibility, the informal mapping reveals more nuanced and human-centric insights into how individuals relate to LL in this fluid context.

Networks

Personal learning vs organisational learning

Both respondents described how learning happens primarily at the individual level. Personal reflection, self-improvement, and experiential knowledge are naturally embedded in their day-to-day work. However, respondents consistently expressed that institutionalisation of such insights is limited, if not absent. The fleeting nature of the project, where teams are assembled for short durations and then dissolve, limits the perceived value of trying to codify lessons into a broader organisational memory.

Interestingly, the notion of role-based learning (e.g., one contract manager learning something and sharing it with another in a similar role) is seen as far more effective than team- or department-wide learning. This insight reinforces the idea that peer-to-peer exchange within similar roles is a more appropriate scale for knowledge sharing in a joint venture setup like Porthos.

Trust and network connections

Both transcripts emphasised that trust and personal connections are key enablers of knowledge transfer in this type of environment. One interviewee noted that even within the same organisation, they would only share lessons with people they knew and liked—highlighting the deeply relational and affective dimension of LL in practice. In other words, people don't share knowledge with organisations; they share it with people.

This links to the approved contribution from PTS_03: even though formal structures may be lacking, those with strong personal networks find ways to learn and transfer insights informally. This approach is highly context-sensitive and relies on familiarity, mutual respect, and low-friction communication—conditions that are hard to scale but incredibly powerful when present.

Coordinators

Ownership and initiative

Responsibility for LL is largely informal. The culture is "reactive" rather than proactive—when LL practices do emerge, it is either due to contractual obligations or an individual taking initiative. One respondent reflected that a higher-up manager will probably mandate a LL session at the end of the project, which "will be very formal" and possibly ineffective if not accompanied by genuine ownership.
The insight here is that ownership is not embedded; it is ad hoc and dependent on interpersonal motivation. Even when the idea of assigning a role was raised, respondents were sceptical that it would be taken seriously unless it was backed by strong internal support or incentives.

Systems

Barriers and limitations
Barriers to LL sharing are seen as both structural and behavioural. Structurally, the project setup does not allow for long-term thinking, and the absence of a stable team structure reduces opportunities for embedded improvement. Behaviourally, people are either too busy or lack the motivation to drive LL efforts unless directly incentivised or supported.
This is particularly evident in the idea that LL is often not identified as such—people adjust their work but do not document or share their insights unless prompted. There is also a risk that even when lessons are shared, they may be ignored unless directly relevant to someone's specific context or role.…

7.2.4 Rijkswaterstaat

The informal mapping for Rijkswaterstaat reveals a strong awareness of the limitations of past Lessons Learned (LL) approaches and a conscious attempt to explore new pathways for improvement, particularly around network-based knowledge exchange. Nonetheless, implementation is constrained by several structural and behavioural frictions that limit their practical impact.

Networks

Organisational beliefs about lessons learned
The interviewee from Rijkswaterstaat acknowledged that while LL has long been recognised as valuable, previous efforts have been undermined by a lack of perceived impact. Traditional practices—such as report writing or database archiving—were seen as inadequate due to their failure to influence actual behaviours or future decisions. There is a growing belief that for LL to become effective, it must occur in more dynamic and interactive formats. This belief has driven the creation of an internal online network platform designed to facilitate real-time peer-to-peer knowledge sharing.

However, the current iteration of the platform is still largely dependent on the initiative of individuals: users must proactively seek help by posting questions, hoping that others with relevant knowledge will respond. This model reflects a bottom-up vision of knowledge exchange, which, while empowering in theory, conflicts with more traditional top-down accountability structures in public organisations. Moreover, this system places a cognitive and time burden on employees who are not incentivised or required to engage in such exchanges. The interviewee acknowledged that this model creates "fragmented" knowledge flows and that participation is sporadic at best.

Coordinators

Engagement and ownership

Rijkswaterstaat has no dedicated LL roles at the project team level, and responsibility for knowledge sharing is loosely distributed across department leads. This creates a blurry sense of ownership, with engagement driven more by personal motivation than by structural mandate. The organisation recognises this as a limitation but is also constrained by its status as a public body—budgetary constraints and the need to justify investments to taxpayers limit the organisation's flexibility to assign dedicated LL coordinators or to overhaul its systems.

Interestingly, the organisation seems to rely more heavily on internal champions—those individuals who are naturally curious, connected, or experienced enough to navigate the platform or network—than on any enforced mechanisms. This represents both an opportunity and a vulnerability. While it enables agile exchanges in some cases, it also creates gaps in equity and consistency, as valuable knowledge may remain siloed.

Systems

Learning style and evaluation practices

The current approach privileges reactive learning, where lessons are identified mainly after mistakes have occurred or after projects have concluded. Even when lessons are identified, implementation is weak: the gap between knowing and doing is rarely closed. The interviewee expressed frustration that many internal reports are written but never used, and this awareness has led to a certain cynicism around the LL process.

What RWS is attempting, however, is to stimulate learning through networking rather than reporting, which is a cultural shift worth noting. The idea that knowledge travels through human connections rather than systems is gaining traction, but the structure to enable this remains underdeveloped. Without a stronger institutional backbone, the learning stays mostly personal or role-based, never fully becoming organisational knowledge.

Informality and structure

The organisation's attempt to address the failure of rigid repositories by promoting informal exchange is conceptually strong but under-supported. The design of the online portal represents a step toward hybridisation—merging informality with systematisation—but its reliance on voluntary engagement hinders scale and sustainability. The lack of incentives, absence of tracking mechanisms, and dependence on goodwill make the system vulnerable to underuse.

Moreover, the fact that the lessons exchanged through the platform remain untraceable, unarchived, or unevaluated limits their strategic value. There is no mechanism to observe emergent patterns, identify recurrent issues, or use insights to refine procedures or contracts. Thus, while the system creates visibility for individual exchanges, it fails to transform them into actionable insights at the organisational level.

7.2.5 Summary

To summarise the empirical observations, the informal mapping builds on the same three domains of networks, coordinators, and systems, but shifts the focus to how lessons learned practices are experienced and perceived by employees. The consolidated findings are presented in Table 8, which contrasts the formal arrangements with the informal dynamics that shape how these practices actually function in daily work. The overview captures, in a concise and comparable form, the passage between official procedures and lived realities across the four organisations. By aligning both perspectives under the same domains, the comparison makes visible where formal practices are reinforced by informal behaviours, and where gaps, tensions, or vulnerabilities emerge. Interpretations of these observations and their implications for improvement will be addressed in the following chapter (Chapter 8).

Domain	Port of Rotterdam	TenneT	Porthos	Rijkswaterstaat
Networks	- Port Wizard links staff to subject-matter experts - Knowledge framed as "in people's minds" - Formal networks reinforce collaboration across projects. - Knowledge accessed via trusted experts - Strong reliance on personal ties and informal exchanges	- Interpersonal ties and direct communication dominate over formal repositories - Reliance on personal trust limits wider dissemination - LL seen as "tick-box" - Often too late - Networks rely on peers and "grey hairs" - Restructuring threatens ties	- Informal, role-based exchanges dominate - No central platform - Knowledge remains fragmented - Learning mostly individual - Peer-to-peer stronger than team-wide - Trust-based sharing only with known contacts	- Online portal designed as interactive platform - Rarely consulted proactively - Reliance on personal networks and staff mobility for knowledge flow - Belief that reports/archives ineffective - New platform valued but engagement fragmented
Coordinators	- Project controllers coordinate evaluations - Subject-matter specialists maintain knowledge areas - Project managers hold ultimate accountability - Psychological safety supports sharing - Role-based groups exchange freely - Senior staff act as "encyclopedias"	- Quality managers or support staff initiate sessions but lack mandate for follow-up - Absence of a dedicated LL role - Transfer often depends on presence of receiving team members - Ownership unclear - Internal sessions open, external guarded - Focus on negatives - Weak follow-up	- No designated LL coordinator - Responsibility left to project/contract managers - Follow-up ad hoc and dependent on individual initiative - Ownership reactive, not embedded - Late sessions seen as formalities - Scepticism toward dedicated roles	- Responsibility fragmented across departments - No project-level LL roles - Proposals for dedicated coordinators face cost resistance - Ownership blurry - Depends on internal champions - Budget limits coordinators
Systems	- LL embedded in project plans - Action-oriented recommendations feed quarterly updates to procedures/templates - Evaluations at stage gates and ad-hoc issues - Reflection triggered by tensions - Spontaneous sessions and social events matter - Reliance on few senior brokers is a risk	- Lessons recorded in spreadsheets/databases but rarely reused - Integration inconsistent across projects - Sessions often too late - One-off projects silo lessons - Lessons often questioned for relevance - Little tailoring - Weak feedback loops erode motivation	- LL occasionally included after partial handovers - Mostly treated as contractual requirement - Registers used inconsistently - Dissemination largely confined to originating teams - Temporary setup hinders continuity - Low motivation - Undocumented adjustments common - Lessons ignored unless directly relevant	- LL not systematically embedded - Reflections occur reactively - Some team-building sessions with contractors - Portal underused - Lessons rarely integrated into templates - Learning mostly reactive - Reports unused - Portal under-supported - Lessons untraceable - Networking valued but lacks backbone

Tab. 8 Informal Mapping [Author]

8 TAILORED RECOMMENDATIONS

This chapter translates the analytical findings and theoretical framework into tailored recommendations for each of the four client organisations. Grounded in both formal and informal mapping, and supported by the socio-technical insights developed through Structuration Theory, these recommendations aim to bridge the gap between current Lessons Learned (LL) practices and more effective, embedded approaches.

Rather than prescribing a one-size-fits-all solution, the recommendations respond to the specific dynamics, constraints, and maturity levels of each organisation. They are derived from the unique interplay of structure and agency observed in each context, and are intended to build on existing strengths while addressing persistent gaps identified throughout the research.

Each subsection presents targeted guidance for one organisation, with a brief explanation of the rationale, followed by practical and strategic implications. The proposed directions are not exhaustive, but offer a concrete starting point for shaping future improvements. Where relevant, connections are drawn between the recommendations and the elements of the socio-technical framework introduced in the previous chapter, setting the stage for actionable change tailored to each client's reality.

Port of Rotterdam

Port of Rotterdam stands out among the examined organisations for having one of the most advanced Lessons Learned (LL) systems. The presence of tools like Port Wizard, structured evaluation protocols, and periodic validation cycles already signals a mature governance environment. Employees have undergone LL training, and a shared understanding of the process exists across roles and teams. These elements together create a strong institutional backbone and demonstrate that LL is a culturally legitimised practice.

Still, the analysis also highlighted limitations in the sustainability and scalability of current practices. LL depends heavily on social cohesion and the memory of specific individuals, which could become fragile under conditions of turnover, rapid growth, or changing project dynamics.

Two recommendations follow from this:

Stable Learning Communities through Functional Clustering
Despite the strength of the current LL process, knowledge sharing remains vulnerable to fragmentation due to team rotation and diverse project scopes. Interviewees acknowledged that "knowledge is in people's minds" (POR_02), and that informal networks often outperform repositories in value and relevance.

We recommend that Port of Rotterdam consider forming functional clusters of professionals working on similar civil infrastructure types (e.g., quay walls, railway systems, viaducts). This clustering would increase consistency of personnel across projects, reinforce trust-based relationships, and enhance the effectiveness of both formal LL procedures and informal knowledge exchange. It would also strengthen role-based learning loops by increasing the stability and visibility of domain-specific communities.

This recommendation supports the framework's emphasis on aligning technical, team, and organisational levels through network continuity.

Acknowledge all Lessons with Lightweight Feedback
While Port of Rotterdam excels in identifying and integrating high-value lessons through quarterly cycles, the informal mapping revealed a gap in feedback when lessons are submitted but not acted upon.

To preserve contributor motivation and ensure transparency, we recommend adding a lightweight acknowledgement process for non-implemented lessons. This can be done within Port Wizard, where rejected or postponed lessons receive a simple status update and short explanation. Doing so maintains contributor engagement, reinforces the legitimacy of the system, and ensures closure even when lessons are filtered out.

This step operationalises the feedback element in the framework and reinforces the loop between individual action and organisational response.

TenneT

TenneT's position as a national grid operator gives it a relatively stable and standardised project portfolio, where processes are intentionally formalised to increase predictability and efficiency. While this streamlining strategy is logical given the repetitive nature of its work, the organisation faces a fundamental challenge: the drive for formalisation has inadvertently limited flexibility, and with it, the adaptive space necessary for Lessons Learned (LL) to become a living practice. Interviews revealed that LL procedures are often

seen as peripheral, with limited visibility of how contributions are processed or implemented. This contributes to disengagement and reinforces a pattern where LL is perceived as a symbolic task rather than a core improvement mechanism.

Structured Update Cycle

The primary recommendation is to introduce a structured, but lightweight update cycle for templates, procedures, and working standards, inspired by the successful quarterly rhythm used by Port of Rotterdam. This does not mean abandoning the benefits of standardisation—indeed, a fully flexible system would conflict with TenneT's operational model—but it does mean creating regular, predictable opportunities to evaluate which lessons merit integration into existing frameworks. The update cycle could be semi-annual, or aligned with project programme phases, but its function should be clear: to translate valuable lessons into systemic improvements, visibly and repeatedly. This feedback rhythm would reinforce employee engagement by showing that lessons are not only heard but acted upon, restoring confidence in LL as a meaningful tool for continuous improvement.

Dedicated LL Coordinators

A secondary, reinforcing recommendation is to introduce dedicated LL coordinators or brokers—persons embedded within quality teams, the PMO, or drawn from recognised opinion leaders—who ensure that lessons are filtered, followed up, and routed to the right channels. These individuals would not replace existing roles but act as facilitators, supporting teams in structuring LL sessions, capturing transferable knowledge, and ensuring that follow-up is monitored. Their presence would reduce over-reliance on already overstretched project managers, increase accountability for implementation, and strengthen the cultural embedding of LL. As discussed in the informal mapping and analysis, ownership and feedback are essential to transforming LL from symbolic activity into a sustained organisational routine.

Together, these two interventions would allow TenneT to preserve the benefits of its structured project delivery while restoring the adaptive flexibility necessary for learning. They reflect the central message of the framework: LL is not a standalone activity but a socio-technical process that must be continuously nurtured through structure, agency, and cultural reinforcement.

Porthos

The case of Porthos stands out from the other client organisations due to its joint venture nature. As a collaboration between multiple partners, each bringing their own procedures, roles, and organisational cultures, the conditions for developing centralised Lessons Learned (LL) systems are

significantly more complex. The interviews made clear that while collaboration is high and there is a shared sense of purpose, the fragmentation of ownership and lack of embedded LL structures limit the potential for structured, cross-organisational learning. Nevertheless, practices such as partial handover reflections and role-based knowledge exchange show promising starting points. Recommendations for Porthos therefore centre on consolidating what already works at the project level, while avoiding overly centralised systems that would not match the temporary and decentralised nature of the joint venture.

Strengthen project-based Lessons Learned

The most actionable improvement for Porthos is to focus its LL efforts firmly at the project level. The current structure—based on partial handovers—already enables periodic reflection and feedback. These handover sessions should be used consistently as the default moments for capturing, discussing, and implementing lessons across project phases. Unlike a traditional stage-gate system, these events are embedded in project dynamics and offer a natural rhythm for learning. By institutionalising this practice with lightweight documentation and action planning, Porthos can ensure that lessons are not only identified but also applied within the same project. Additionally, each partner organisation should be encouraged to extract and retain LL specific to their internal workflows and collaboration experiences, enabling them to bring this knowledge back into future ventures. This would avoid relying solely on a final, end-of-project evaluation, which often comes too late to enact meaningful change.

Facilitate informal networks

In a setting where formalised LL systems are difficult to build, informal networks serve as a critical infrastructure for learning. Several interviewees described relying on trusted colleagues or peers in similar roles to obtain knowledge and practical advice. This informal approach is not only natural in joint ventures, but also highly effective when formal systems are absent. Porthos should actively support this by enabling role-based reflection moments, for example by organising occasional peer meetings across functions or disciplines. While lightweight in design, such gatherings enhance mutual understanding, reduce duplication of effort, and help standardise good practices without enforcing top-down compliance. These networks also provide continuity of learning when staff rotate or projects end, making the informal dimension a strategic resource in complex, multi-party settings.

Rijkswaterstaat

While Rijkswaterstaat has a long-standing commitment to Lessons Learned (LL), their past attempts at creating structured systems have not translated into

tangible learning outcomes. This recognition has led to a commendable shift toward enhancing network-based knowledge exchange, evidenced by the development of a web platform that allows employees to post requests and receive knowledge contributions from peers. The intention is well-placed: it acknowledges that LL happens most effectively through interpersonal sense-making and recognises the value of networks over static documentation.

However, this bottom-up, fully voluntary structure rests too heavily on personal initiative. As also highlighted in the interview, participation requires employees to take time away from their own projects—without immediate benefits or recognition. Over time, this lack of feedback and alignment with professional obligations is likely to reduce engagement, fragment knowledge, and hinder the organisation's ability to consolidate and scale valuable insights.

From the lens of Structuration Theory, the current platform does not yet constitute a sustainable structure. While it fosters informal interaction (signification), it lacks the authoritative and allocative reinforcements needed to reproduce LL as a legitimised and embedded routine. In this sense, the initiative risks becoming a symbolic rather than transformative effort.

A more strategic move would be to reconfigure the platform toward a Port-Wizard-like structure, functioning as a dynamic expert directory rather than a passive message board. Instead of asking for help in open posts, employees should be able to directly identify and contact named colleagues who hold relevant expertise, roles, or LL ownership. This repositioning would maintain the network-first approach but reduce participation friction, allow for clearer tracking of requests, and improve both trust and traceability.

Critically, such a change would not require significant financial investment—an important consideration given Rijkswaterstaat's constraints as a public entity. Instead, it would realign existing practices with more effective resource use, enhance informal practices through minimal structural redesign, and support the emergence of a culture where knowledge sharing is seen as actionable, supported, and rewarding.

Concluding Remarks

The recommendations outlined in this chapter reflect the diversity and complexity of Lessons Learned (LL) practices across the four client organisations. While each context requires a distinct approach, the suggestions are unified by the central insight of this thesis: that effective LL practices emerge not from procedures alone, but from the interaction between formal structures, cultural norms, and the agency of individuals.

9 VALIDATION

This chapter presents the validation of the developed framework through a structured expert review. By gathering targeted feedback from experienced professionals in the construction sector, the aim was to assess whether the framework is complete, insightful, and practically applicable. The findings help substantiate the framework's value while identifying areas for refinement and future development.

Purpose and Approach

To ensure the reliability and practical relevance of the developed framework, a validation step was conducted using a structured questionnaire administered to a panel of external professionals. The goal was to assess the framework's completeness, effectiveness, and feasibility/applicability—three dimensions that are commonly used in framework validation [Wieringa, 2014]. These dimensions correspond respectively to whether the framework captures the essential constructs, supports the intended understanding, and can be practically implemented.

The validation approach was based on expert evaluation via structured surveys, a well-established method in qualitative research to assess the utility and clarity of conceptual frameworks [Braun et al., 2021]. This approach allows researchers to obtain both quantitative and qualitative feedback, particularly when implementation-based validation is not feasible within the project scope [Venable et al., 2016].

Participant Selection

The participants were selected based on their experience in client-side construction projects and their familiarity with knowledge management or organisational learning processes. Importantly, all four participants were external to the research process and had not been involved in earlier stages of the thesis. This selection strategy allowed for a fresh and unbiased evaluation of the framework from informed practitioners. The diversity of their client-related experience contributed to a broader perspective on the framework's potential applicability across different contexts.

Informative Session

In preparation for the survey, a 60-minute presentation session was organised. Given the conceptual and empirical density of the thesis, the session served to inform participants of the research aims, methods, key findings, and the structure of the final framework. This approach follows established practices in design science and qualitative evaluation, where participant understanding is considered a prerequisite for meaningful feedback.

The session was not intended to elicit real-time feedback but to equip participants with a clear understanding of the framework prior to completing the questionnaire. As such, it functioned similarly to a validation briefing or research artefact walkthrough, as described in the literature on expert-based evaluations [Hevner et al., 2004].

Questionnaire Design

The validation instrument consisted of a structured online questionnaire, divided into three sections corresponding to the validation dimensions:

- Completeness: The degree to which the framework captures the relevant influencing factors of Lessons Learned practices.
- Effectiveness: The extent to which the framework enhances understanding of LL processes and challenges.
- Feasibility / Applicability: The usability of the framework in practical client-side project environments.

Each section included:

- Three closed questions based on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree).
- One open-ended question allowing for elaboration, critique, or suggestions.

This format was selected to combine the benefits of structured assessment with opportunities for contextual nuance (Fink, 2013). The full questionnaire protocol is included in the Appendix (Appendix 3).

Results – Completeness

The first part of the validation assessed whether the framework adequately captures the full range of factors that influence Lessons Learned (LL) practices within client organisations. Quantitative results show a strong consensus: all four respondents agreed (4 out of 5) that the framework includes the main factors affecting LL (Q1.1), while three agreed and one strongly agreed that the transition from empirical and theoretical research to the framework is

logical and convincing (Q1.2). Similarly, all participants agreed that the framework successfully captures the organisational dynamics—both formal and informal—that shape LL practices in practice (Q1.3). These scores indicate a high level of perceived completeness.

The open-ended responses provided valuable nuance. Three out of four respondents suggested areas that could be elaborated further, even if they acknowledged these may fall outside the direct scope of the research. One participant noted that the process of maintaining and using lessons after they are formalised is less visible, and may require additional attention for real-life application. Another highlighted the individual/people aspect, referring to the role of specific personalities or personal initiative in determining the effectiveness of LL systems. A third respondent mentioned that while the framework stresses cultural dynamics, it does not fully integrate structured change management approaches. One participant noted no missing elements.

Taken together, these results confirm that the framework is perceived as complete and well-structured by the expert panel, capturing the key formal and informal elements that influence LL practices. At the same time, the open feedback highlights important adjacent areas—such as maintenance, individual behaviour, and change management—that may deserve further development in follow-up research or implementation efforts.

Results – Effectiveness

The second part of the validation focused on how well the analysis and framework support understanding of Lessons Learned (LL) processes and challenges in client organisations. The overall assessment was positive. Half of the respondents strongly agreed, and the other half agreed, that the framework improves understanding of how LL operates in practice (Q2.1). A similar pattern emerged for Q2.3, with all four respondents agreeing or strongly agreeing that the framework clarifies why LL practices often fail to move beyond documentation. Responses to Q2.2, concerning whether the framework adequately explains LL challenges and their resolution, were slightly more varied: one respondent remained neutral, while the others agreed or strongly agreed. These results indicate a solid perceived effectiveness, with some room for deeper elaboration on how challenges are addressed.

Open comments revealed three critical observations. First, one respondent noted that the framework does not explicitly incorporate differences in organisational characteristics such as size or culture. Second, another participant pointed out that the perceived importance of LL (at both individual

and organisational levels) is not sufficiently addressed. While the empirical findings touch on time pressure, the respondent questioned whether the motivational drivers behind LL engagement had been fully explored. A third comment remarked that although the framework usefully bridges process and behavioural aspects, it lacks benchmarks against existing LL models and offers limited guidance for implementation across a broader range of stakeholder environments. One respondent indicated no shortcomings.

These findings suggest that the framework is effective in providing a deeper understanding of LL as a socio-technical process, especially in clarifying persistent challenges and structural barriers. However, future development could benefit from refining how the framework accommodates different organisational contexts, motivational dimensions, and implementation benchmarks—elements that, while beyond the scope of the current research, are important for scaling and operationalisation.

Results – Feasibility / Applicability

The third validation dimension concerned the practical use of the framework: whether it is feasible to apply in construction client organisations and whether the proposed tailoring approach effectively supports implementation. The quantitative results were positive, though slightly more varied than in the previous dimensions. For Question 3.1, which asked whether the framework is feasible given organisational structures and governance, participants responded with one neutral, two agreements, and one strong agreement. Similarly, for Question 3.2, which assessed the usefulness of the tailoring approach, two participants remained neutral, one agreed, and one strongly agreed. The most consistent results were for Question 3.3, which evaluated whether the framework can help prioritise LL improvement efforts: three participants agreed and one strongly agreed. Overall, these scores indicate a moderate to high perceived applicability, with some room for further operational development.

The open comments provided additional insight into the perceived strengths and challenges of implementation. One respondent highlighted organisational resources as a potential barrier, noting that applying the framework might depend on "availability of funds and assets." Another emphasized the need for practical tools and actionable outputs, suggesting that the framework would benefit from clear follow-up tools once LL priorities have been identified. A third respondent pointed to cultural resistance as the main challenge in implementation—particularly the risk of a compliance mindset—and stressed the role of training, technology, and accountability in embedding LL as routine practice. Finally, one participant viewed the framework as an opportunity for impact measurement, proposing that

organisations could use it to track reductions in repeated issues or efficiency gains over time.

Taken together, these responses indicate that the framework is seen as broadly feasible and valuable for client organisations, particularly in supporting prioritisation and reflection. However, they also highlight practical concerns: ensuring organisational readiness, complementing the framework with operational tools, and addressing cultural factors that affect real-world adoption. These observations validate the framework's socio-technical ambition while reinforcing the need for careful implementation planning tailored to each organisational context.

Conclusion

The validation results confirm that the framework is perceived as complete, insightful, and broadly applicable by practitioners experienced in client-side infrastructure projects. Respondents consistently agreed that the framework captures essential formal and informal dynamics, enhances understanding of Lessons Learned (LL) processes, and offers practical value for prioritisation and improvement. At the same time, open comments point to opportunities for strengthening the framework's operational guidance, adaptability to different organisational contexts, and alignment with change management practices. These insights reinforce the framework's conceptual robustness while highlighting the importance of tailored implementation strategies in real-world settings. Full results in the Appendix (Appendix 4).

10 DISCUSSION & CONCLUSION

Discussion

This thesis aimed to develop an approach that enables construction client organisations to diagnose and improve their Lessons Learned (LL) practices by bridging technical processes with behavioural dimensions. The research achieved this aim through two complementary contributions. First, it established general guidelines, consolidating the socio-technical conditions that are recurrent in literature and practice and translating them into a comprehensive framework for LL. Second, it generated tailored recommendations for four client organisations, showing how the general framework can be adapted to specific organisational contexts and used to guide short-term interventions.

The general guidelines build on themes that are already recognised in the literature—such as documentation, culture, timing, and dissemination—but contribute by presenting them in an integrated manner. The distinctive aspect of this framework is that it was developed through the lens of Structuration Theory, which allowed the technical and behavioural aspects to be considered in relation to each other rather than as separate domains. This theoretical lens revealed how the tension between formal LL systems and informal practices shapes outcomes in client organisations, and how both need to be aligned for effective learning to occur.

The tailored recommendations demonstrate that it is possible to perform a diagnosis of organisational practices that not only captures the formal systems in place but also the way people respond to and interact with them. By linking this diagnostic step to the general framework, the research shows how organisations can identify entry points for intervention that are both relevant to their immediate context and consistent with broader principles of effective LL. This illustrates that interventions need not be large-scale redesigns, but can also take the form of targeted, context-sensitive adjustments guided by socio-technical understanding.

From a theoretical perspective, the thesis highlights the value of Structuration Theory as a means of bridging the social and technical dimensions of LL. The three modalities provided a robust analytical structure for both empirical data and literature findings, ensuring that behavioural and technical factors were

not considered in isolation. In doing so, the thesis contributes to extending the application of Structuration Theory within construction management, demonstrating its relevance not only for understanding organisational behaviour but also for designing practical tools.

An important aspect of this thesis was the decision to structure the analysis around networks, coordinators, and systems, derived from the duality of structure in Structuration Theory. This assumption was critical in operationalising the socio-technical perspective. Systems represent the formal procedures and technical tools that typically dominate LL discussions; networks capture the informal, behavioural side of knowledge sharing; and coordinators act as the interface between the two, mediating how structures and agents interact.

By framing the research in this way, the thesis ensured that LL were not reduced to documentation alone, a risk that has often limited their effectiveness. Instead, it became possible to analyse how practices unfold across the interplay of systems, networks, and coordinators, both in general terms and in specific client contexts. This triad thus provided the analytical structure that underpins the general guidelines and enabled the development of tailored recommendations. In doing so, the research demonstrates that going "beyond documentation" requires not abandoning systems but situating them within the broader socio-technical dynamics of networks and coordinators.

From a practical perspective, the research provides client organisations with both an overview tool and a diagnostic path. The overview, in the form of general guidelines, helps organisations understand what is broadly relevant to LL in their sector. The diagnostic path, through tailored recommendations, illustrates how they can evaluate their own practices and identify interventions suited to their situation. Together, these contributions move beyond fragmented or symbolic LL practices and offer clients a structured way to embed learning as both a systematic and socially sustainable activity.

Conclusion

This research has delved into the practices of lessons learned (LL) within construction client organisations, examining how they function as socio-technical systems shaped by both formal structures and informal behaviours. Guided by the perspective of client organisations, the study explored LL through theoretical lenses, empirical investigation, and analytical synthesis, complemented by a validation step. The main objective of the thesis was to answer the following research question:

"How can construction client organisations enhance lessons learned practices across different organisational contexts and develop strategies for their improvement?"

As outlined in Chapter 1, this overarching question was addressed through three specific sub-questions, each approached via literature review, empirical research, and thematic analysis. Together, these strands informed the development of a framework that identifies the essential aspects of effective LL and couples it with a walkable path for organisations to relate their own practices to broader socio-technical dynamics. In doing so, the thesis provides both conceptual clarity and practical guidance for enhancing LL in construction client organisations.

RQ1 – What are the main characteristics of current lessons learned (LL) practices in construction client organisations?

Current lessons learned practices in construction client organisations are characterised by a tension between formal structures and informal behaviours. Identification is the most established phase, yet it is typically conducted at the end of projects when opportunities for proactive adjustment have already passed, while the subsequent phases of dissemination and implementation, which in practice cannot be meaningfully distinguished, are even more problematic. Documentation is generally produced and repositories exist to collect lessons, but these repositories rarely serve as more than an end point; they stabilise knowledge but are not effectively used to transfer or reuse it. Follow-up mechanisms are weak, and accountability for lessons is rarely formalised, with responsibilities scattered across roles such as project managers, project controllers, or quality officers, but without clear ownership or enforcement. While the literature stresses pervasive cultural barriers such as fear of blame or reluctance to share, the empirical material suggests that these are most pronounced in collaborations with external parties; within organisations themselves, such behaviours are less dominant. Instead, knowledge exchange is sustained primarily through personal connections and trusted networks, with individuals preferring to approach colleagues directly rather than consult formal registers, particularly when facing urgent problems or at the start of projects. As a result, the extent to which lessons are shared and applied depends strongly on individual tendencies and personal initiative rather than institutionalised routines. Overall, current LL practices thus display a formal presence but limited functional depth, where structured systems remain underused and learning is ultimately shaped by interpersonal dynamics and contextual trust.

To capture these dynamics more systematically, this thesis structured LL practices into three domains: systems, networks, and coordinators. Systems

represent the formal tools and procedures, networks reflect the informal exchanges through which knowledge often circulates, and coordinators act as the interface that connects the two. This triad provided the analytical foundation for the thesis, ensuring that the socio-technical nature of LL was kept central throughout the analysis.

RQ2 – In what ways do LL practices differ across types of construction client organisations?

Across all client organisations studied, lessons learned are widely acknowledged as a potential means to improve both projects and organisational knowledge. This recognition is also evident in public organisations, where LL is clearly valued, but the scope for embedding it more systematically is constrained by the nature of public governance. Limited financial flexibility, accountability to taxpayers, and the need to prioritise primary service delivery leave fewer resources for investing in practices that are perceived as "additional." As a result, efforts are made to integrate LL into existing structures, but the room for improvement remains limited. Private organisations face fewer financial constraints, and when commitment is present, they can invest in systematic processes that make LL more effective. However, this is not guaranteed: in some cases, LL practices are implemented successfully and embedded in organisational routines, while in others they conflict with broader organisational aims such as efficiency or streamlining, which leads to fragmented or underutilised systems. In these contexts, LL is too often treated as a separate add-on—commonly a repository or register—rather than as an integrated process that requires continuous effort and cultural commitment. The challenge is even more pronounced in joint ventures, where embedding LL is already difficult within a single organisation and becomes further complicated by the need to balance multiple organisational agendas, contractual obligations, and reputational concerns. In such multi-party settings, the organisational level is rarely the most effective domain for learning; instead, LL tends to remain confined to the project level, where it can be managed more directly. Taken together, these findings suggest that while all types of client organisations value LL, their ability to operationalise it depends less on ownership structure itself and more on the resources, strategic alignment, and collaborative complexity that shape how LL is enacted. To be effective, LL ultimately requires an omni-comprehensive understanding that extends beyond technical procedures into cultural and behavioural dimensions, as well as a sustained level of organisational commitment to embed these practices meaningfully.

RQ3 - So what strategies can construction client organisations adopt to improve the effectiveness of lessons learned practices?

Construction client organisations can enhance the effectiveness of lessons learned (LL) practices by recognising them as socio-technical systems that require both structural and behavioural alignment. The framework developed in this thesis serves as a general guideline, pointing to the most relevant aspects that must be considered to design an effective LL process. These aspects include the type of learning being pursued, the filtering of lessons and their audience, the importance of network connections, and the understanding that processes should be seen as enablers rather than as complete solutions. They also include the need for supportive systems, clear ownership and accountability, feedback mechanisms, and a balance between top-down and bottom-up initiatives. Furthermore, organisational trainings and attention to informal mapping are essential to legitimise practices and embed them into everyday routines. The framework adds additional elements to strengthen implementation, such as stage-gate evaluation moments, role-based exchanges at the technical level, validation cycles for lessons, alignment with project phases, and the transformation of practices into stable routines. Taken together, these elements provide organisations with a structured overview of what must be in place to move from symbolic compliance to meaningful learning.

However, the framework is not a prescriptive process in itself, but a flexible tool that organisations should adapt to their specific conditions. This requires connecting the framework with an understanding of how their own structures and behaviours function. Following Giddens' five steps of structuration, this begins with formal mapping—documenting current practices and responsibilities—and informal mapping—understanding how people respond to and navigate within those structures. These two steps together already provide critical insights: by comparing the organisation's structural arrangements with the way employees act in practice, it becomes possible to identify where misalignments exist and which elements of the framework are most urgent to prioritise. Although this study did not extend to the subsequent three steps of structural adaptation, the approach demonstrates how linking formal and informal mapping to the framework can guide targeted improvements. Ultimately, effective LL strategies require an omni-comprehensive understanding that integrates technical, cultural, and behavioural dimensions, combined with a genuine organisational commitment to sustained improvement.

In addition to the framework, the thesis also developed tailored recommendations for the four client organisations studied. These recommendations demonstrate how the general guidelines can be connected to specific organisational contexts, providing short-term, targeted improvements that are sensitive to local structures and behaviours. This dual

outcome—general guidelines and context-specific recommendations—shows that the approach is both broadly informative and practically adaptable.

MRQ - How can construction client organisations enhance lessons learned practices across different organisational contexts and develop strategies for their improvement?

This thesis has shown that while lessons learned are widely recognised across client organisations, their practices remain fragmented, heavily dependent on informal networks, and often constrained by structural or contextual factors. Public, private, and joint-venture organisations face different challenges, yet in all cases the effectiveness of LL depends not on ownership type alone but on the alignment between structural mechanisms and cultural or behavioural conditions. The framework developed here provides a general guideline that identifies the key aspects necessary for effective LL and highlights the need to integrate technical procedures with cultural enablers and organisational commitment. By linking this framework to an understanding of how formal structures operate in practice and how individuals respond to them, organisations can identify where improvements are most needed and prioritise their efforts accordingly. In this way, LL can evolve from a symbolic exercise into a sustained practice that enhances both project outcomes and organisational learning.

In this way, the thesis goes beyond documentation by situating LL within the broader interplay of systems, networks, and coordinators, showing that effective learning emerges only when these dimensions are aligned.

11 LIMITATIONS & FORESIGHTS

This final chapter reflects critically on the limitations of the research and outlines directions for future investigation. While the thesis offers a novel framework and empirical insights into Lessons Learned (LL) practices in client organisations, its scope, methods, and analytical choices inevitably involved trade-offs. Acknowledging these constraints provides transparency, while identifying areas for future research helps position this study as a foundation for continued academic and practical development.

Limitations

This thesis presents a comprehensive analysis of Lessons Learned (LL) practices in Dutch construction client organisations, but several limitations must be acknowledged with respect to its methodology, scope, analytical lens, and validation process.

- Methodological limitations arise from the portfolio and sampling strategy. While the research intentionally selected a diverse set of client organisations—spanning public, semi-public, and private sectors—the results cannot be generalised to all organisations within these categories. For example, TenneT's approach may not reflect broader trends among private clients. However, this diversity was necessary to test the tailoring dimension of the framework and does not diminish its relevance; rather, it illustrates its potential adaptability. Another methodological constraint relates to interview sampling. The empirical data are based on interviews with senior managers and team leaders, which offers strategic and systemic insight into LL practices but does not capture the full range of user perspectives. A more granular organisational study (e.g., with a larger sample of project team members, engineers, and middle managers) would enrich the analysis and enable deeper organisational diagnosis.

- Scope-related limitations are also present. The thesis aims to bridge various disciplinary and thematic strands within a single socio-technical perspective. As a result, the scope had to remain relatively broad. This allowed for the identification of overarching patterns and structural dynamics but limited the depth of exploration in any single subdomain.

Future research may focus more narrowly on individual components of the framework, such as cultural embedding, behavioural reinforcement, or system integration, to build on the foundation established here.

- Analytical limitations stem primarily from the use of Structuration Theory as the sole interpretive lens. Giddens' framework proved effective for capturing the dual technical and behavioural nature of LL practices and for interpreting their reproduction within organisational systems. However, the decision to rely exclusively on this theory necessarily bound the analysis: key findings and conclusions are tightly coupled to Giddens' conceptual vocabulary. While this theoretical alignment strengthens internal coherence, it may exclude alternative perspectives—such as institutional theory, change management frameworks, or implementation science, that could have offered additional or complementary insights.

- Validation-related limitations concern the format and depth of the expert feedback process. Although four external practitioners participated in a structured validation survey following a preparatory session, the use of a questionnaire inherently limited the depth of dialogue. More interactive formats, such as expert interviews, validation workshops, or focus groups, could have enabled richer discussion, clarification of viewpoints, and co-refinement of the framework. The current approach yielded valuable feedback, especially given time and access constraints, but future work could explore more collaborative modes of validation to strengthen both academic rigour and practical relevance.

Taken together, these limitations are intrinsic to the scope and design of the study and should be considered when interpreting the findings. Nonetheless, the research offers a robust foundation for understanding and improving LL practices in construction client organisations, particularly when extended through further empirical work and theoretical refinement.

Foresights

This thesis contributes to a more integrated understanding of Lessons Learned (LL) practices in construction client organisations, but it also opens several avenues for future research. These opportunities emerge from both the complexity of the topic and the constraints of the current study.

- Future research could focus on applying and testing the proposed framework in practice. While this study offered a validated conceptual

model, a logical next step would be to operationalise it within one or more client organisations. Such implementation-based research could explore how the framework can guide organisational reflection, LL process improvement, or project learning interventions in real-world settings. This would also allow for iterative refinement of the framework, based on observed outcomes and practitioner feedback.

- The training and behavioural embedding of LL practices emerged as a critical theme in both the analysis and the validation. However, due to its complexity and contextual variability, this topic could not be fully addressed within the current scope. Future research could explore how structured training programs, behavioural reinforcement mechanisms, or internal change agents can be leveraged to embed LL as a cultural and operational norm—particularly in contexts where compliance mindsets or informal norms act as barriers.

- Future studies may focus on the individual outputs of this research, such as signification patterns, informal behaviours, timing mismatches, or role tensions. These findings were thematically identified and theoretically interpreted, but each represents a standalone problem space that deserves further, more detailed investigation. Such studies could adopt either qualitative deep-dives or mixed-methods approaches to unravel specific tensions or solutions.

- Further research into evaluating the actual impact of LL practices on project and organisational performance. While the value of LL is widely assumed, it remains difficult to measure in practice. Future work could develop metrics, KPIs, or impact-tracking systems that assess how LL activities translate into reduced rework, improved decision-making, or efficiency gains over time. Such research could help quantify the return on investment of LL initiatives, strengthening their case within organisational strategy.

Together, these foresights highlight a productive research agenda that builds on the socio-technical foundation developed in this thesis, while extending its insights into practical, measurable, and scalable improvements in the way construction client organisations learn from their projects.

Bibliography

Aguinis, H., & Kraiger, K. (2009). Benefits of training and development for individuals and teams, organizations, and society. *Annual Review of Psychology*, *60*, 451–474. https://doi.org/10.1146/ANNUREV.PSYCH.60.110707.163505

Almeida, M. V., & Soares, A. L. (2014). Knowledge sharing in project-based organizations: Overcoming the informational limbo. *International Journal of Information Management*, *34*(6), 770–779. https://doi.org/10.1016/j.ijinfomgt.2014.07.003

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. https://doi.org/10.1016/j.ijproman.2010.06.002

Bang, B. P. (1987). *Politics as Praxis: A New Trend in Political Science* (1st ed., Vol. 90). Statsvetenskaplig Tidskrift.

Braun, V., Clarke, V., Boulton, E., Davey, L., & McEvoy, C. (2021). The online survey as a qualitative research tool. *International Journal of Social Research Methodology*, *24*(6), 641–654. https://doi.org/10.1080/13645579.2020.1805550

Bresnen, M., Goussevskaia, A., & Swan, J. (2005). Organizational Routines, Situated Learning and Processes of Change in Project-Based Organizations. *Project Management Journal*, *36*(3), 27–41. https://doi.org/10.1177/875697280503600304

Caldas, C. H., Gibson, G. E., Weerasooriya, R., & Yohe, A. M. (2009). Identification of Effective Management Practices and Technologies for Lessons Learned Programs in the Construction Industry. *Journal of Construction Engineering and Management*, *135*(6), 531–539. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000011

Carrillo, P. (2005). Lessons learned practices in the engineering, procurement and construction sector. *Engineering, Construction and Architectural Management*, *12*(3), 236–250. https://doi.org/10.1108/09699980510600107

Carrillo, P., Ruikar, K., & Fuller, P. (2013). When will we learn? Improving lessons learned practice in construction. *International Journal of Project Management*, *31*(4), 567–578. https://doi.org/10.1016/j.ijproman.2012.10.005

Chan, P. W. (2020). Revisiting basics: theoretically-grounded interesting research that addresses challenges that matter. *Construction Management and Economics*, *38*(1), 1–10. https://doi.org/10.1080/01446193.2019.1702251

Dickey-Clark, H. F. (1984). Anthony Giddens' Theory of Structuration. *Canadian Journal of Political and Social Theory*, *8*, 133–138.

Duffield, S., & Whitty, S. J. (2014). Developing a systemic lessons learned knowledge model for organisational learning through projects. *International Journal of Project Management*, *33*(2), 311–324. https://doi.org/10.1016/j.ijproman.2014.07.004

Duggan, F., & Banwell, L. (2004). Constructing a model of effective information dissemination in a crisis. *Information Research*, *9*(3). https://informationr.net/ir/9-3/paper178.html#appA

Dutton, C., Turner, N., & Lee-Kelley, L. (2014). Learning in a programme context: An exploratory investigation of drivers and constraints. *International Journal of Project Management*, *32*, 747–758. https://doi.org/10.1016/j.ijproman.2014.02.003

Eken, G., Bilgin, G., Dikmen, I., & Birgonul, M. T. (2020). A lessons-learned tool for organizational learning in construction. *Automation in Construction*, *110*, 102977. https://doi.org/10.1016/j.autcon.2019.102977

Fong, P. S. W., & Yip, J. C. H. (2006). An Investigative Study of the Application of Lessons Learned Systems in Construction Projects. *Journal for Education in the Built Environment*, *1*, 27–38. https://doi.org/10.11120/jebe.2006.01020027

Hevner, A. R., March, S. T., Park, J., & Ram, S. (2004). DESIGN SCIENCE IN INFORMATION SYSTEMS RESEARCH. *Design Science in IS Research MIS Quarterly*, *28*(1), 75.

Jones, M., & Karsten, H. (2003). *REVIEW: STRUCTURATION THEORY AND INFORMATION SYSTEMS RESEARCH*. www.jims.cam.ac.uk

Jugdev, K. (2012). Learning from Lessons Learned: Project Management Research Program. *American Journal of Economics and Business Administration*, *4*, 13–22. https://doi.org/10.3844/ajebasp.2012.13.22

Kim, T.-W., & Joh, H.-W. (2005). KEY BARRIERS AND THEIR STRATEGIC RESPONSES TO ACTIVATE KNOWLEDGE SHARING IN CONSTRUCTION ORGANIZATIONS. *International Conference on Construction Engineering and Project Management*, 403–408. https://doi.org/10.6106/ICCEPM.2005.0403

King, W. R. (2009). Knowledge Management and Organizational Learning. In *Annals of Information Systems* (Vol. 4, pp. 3–13). https://doi.org/10.1007/978-1-4419-0011-1_1

Knoth, von A. (2022, February 22). *Desire Path*. https://lost-navigator.net/desire-path/

Loyal, S. (2003). *The Sociology of Anthony Giddens* (Vol. 1). Pluto Press.

Maqsood, T. (2006). *The Role of Knowledge Management in Supporting Innovation and Learning in Construction*.

Milton, N. J. . (2010). *The lessons learned handbook : practical approaches to learning from experience*. Chandos Publishing.

Paranagamage, P., Carrillo, P., Ruikar, K., & Fuller, P. (2012). Lessons learned practices in the UK construction sector: current practice and proposed improvements. *Engineering Project Organization Journal*, *2*(4), 216–230. https://doi.org/10.1080/21573727.2012.681643

Reason, J. (1997). Managing the risks of organizational accidents. In *Managing the Risks of Organizational Accidents* (Vol. 1). Taylor and Francis. https://doi.org/10.4324/9781315543543

Reason, J. (2000). Human error: Models and management. In *British Medical Journal* (Vol. 320, pp. 768–770). BMJ Publishing Group. https://doi.org/10.1136/bmj.320.7237.768

Ribeirinho, M. J., Mischke, J., Strube, G., Sjödin, E., Blanco, J. L., Palter, R., Biörck, J., Rockhill, D., & Andersson, T. (2020). *The next normal in construction How disruption is reshaping the world's largest ecosystem*. https://www.mckinsey.com/~/media/McKinsey/Industries/Capital%20Projects%20and%20Infrastructure/Our%20Insights/The%20next%20normal%20in%20construction/The-next-normal-in-construction.pdf

Rowe, S. F., & Sikes, S. (2006). Lessons learned: taking it to the next level. *PMI® Global Congress 2006*. https://www.pmi.org/learning/library/lessons-learned-next-level-communicating-7991#:~:text=Level%201%3A%20Lessons%20Learned%20Process

Ryd, N. (2014). Construction Clients Challenges – Emphasizing Early Stages. *Procedia - Social and Behavioral Sciences*, *119*, 134–141. https://doi.org/10.1016/J.SBSPRO.2014.03.017

Schein, E. H. (2010). *Organizational Culture and Leadership*. www.josseybass.com

Schindler, M., & Eppler, M. J. (2003). Harvesting project knowledge: a review of project learning methods and success factors. *International Journal of Project Management*, *21*, 219–228. www.elsevier.com/locate/ijproman

Shokri-Ghasabeh, M., & Chileshe, N. (2014). Knowledge management: Barriers to capturing lessons learned from Australian construction contractors perspective. *Construction Innovation*, *14*(1), 108–134. https://doi.org/10.1108/CI-06-2013-0026

Steiner, L. (1998). Organizational dilemmas as barriers to learning. *The Learning Organization*, *5*(4), 193–201. https://doi.org/10.1108/09696479810228577

Szulanski, G. (1996). Exploring Internal Stickiness: Impediments to the Transfer of Best Practice within the Firm. *Strategic Management Journal*, *12*, 27–43. https://doi.org/10.1002/smj.4250171105

Teräväinen, V. J., & Junnonen, J. M. (2019). The promoters and the barriers for organizational culture change in a Finnish construction company. *Construction Innovation*, *19*, 672–688. https://doi.org/10.1108/CI-04-2019-0029

Van Heel, P., Buijs, M., & Wolf, C. (2019). *Over faalkosten in de bouwsector*. https://www.abnamro.nl/nl/media/Verspilde%20moeite.%20Over%20faalkosten%20in%20de%20bouwsector_tcm16-64849.pdf

Venable, J., Pries-Heje, J., & Baskerville, R. (2016). FEDS: A Framework for Evaluation in Design Science Research. *European Journal of Information Systems*, *25*(1), 77–89. https://doi.org/10.1057/EJIS.2014.36/TABLES/2

Wieringa, R. J. (2014). Design science methodology for information systems and software engineering. *Design Science Methodology: For Information Systems and Software Engineering*, 1–332. https://doi.org/10.1007/978-3-662-43839-8

Appendix

Appendix 1 – Interview Protocol

Interview Protocol – Lessons Learned in Client Organisations

I. Introduction (5 min)

Thank you for participating in this interview. This is part of my master's thesis at TU Delft focusing on how client organisations in the construction industry engage with Lessons Learned (LL) practices.

The research aims to explore, and therefore give a possible solution, why lessons learned are seen as relevant, yet often remain ineffective in practice. A key issue appears to be the missing link between formal processes and the behavioural side of how people actually work — in other words, the connection between the technical and social aspects of LL.. This open-ended interview aims gather insights based on your experience, to better understand these dynamics.

- Your responses will remain anonymous and confidential.
- May I record this conversation for analysis purposes?
- To start, could you briefly describe your role and your typical project involvement?

1. What comes to your mind when you hear the term 'lessons learned' in the context of your work?

- How would you describe what people mean when they talk about 'lessons learned' in your organisation?
- Are there different interpretations depending on roles or departments?

2. From your experience, do people tend to share more positive lessons, negative lessons, or both?

- Should they be treated the same way?
- What makes something 'worth sharing' as a lesson?
- Have you ever seen someone resist sharing something that went well?

3. Are there situations where people hesitate to share lessons? What influences that hesitation?

- Do people fear being judged or penalised?
- Does the culture support honest reflection or favour performance over transparency?

4. How do Lessons Learned usually get initiated in your organisation, and who is responsible for following them through?

- Are there people who are formally or informally responsible for LL?
- Are there people who regularly take the lead, or does it depend on the project?
- What role does management play in giving direction or setting expectations?
- Who decides what qualifies as a lesson, or what to do with it?

5. Does your organisation have any policies, rules or expectations related to Lessons Learned?

- Or is it more a matter of good practice or individual initiative?
- Do you know of any project where LL was mandatory or enforced?
    - Do you think teams interpret the expectations differently?
- Would more formalisation help or harm LL engagement? (Would a stricter policy improve LL, or discourage openness?)

6. How do things usually unfold after a lesson is identified in a project team?

- Is there a step where the team decides what to do with that lesson?
- Is there anyone responsible for reviewing or validating it?
- Are there any typical bottlenecks at that moment between identifying and sharing a lesson?
- What influences whether a lesson actually moves forward or just gets left behind?

7. Can you walk me through what happens when a lesson from one project might be relevant for another team/project? (How does it move?)

- How do people find out that a lesson exists?
- Is there a process for this transfer?
- Is this transfer more dependent on systems or on personal networks?
- Does it usually work? Why or why not?
    - Do teams trust lessons coming from outside their own context?

8. How does a lesson from a previous project get implemented in a new one, if at all? (Can you think of a case where this happened — or was supposed to happen?)

- What helped it get used, or what got in the way?
- How do people know whether a lesson from the past applies to their current situation?
- Are there routines, tools, or people that help bridge that gap?

9. Imagine you could design the ideal process for Lessons Learned in your organisation — how would it look?

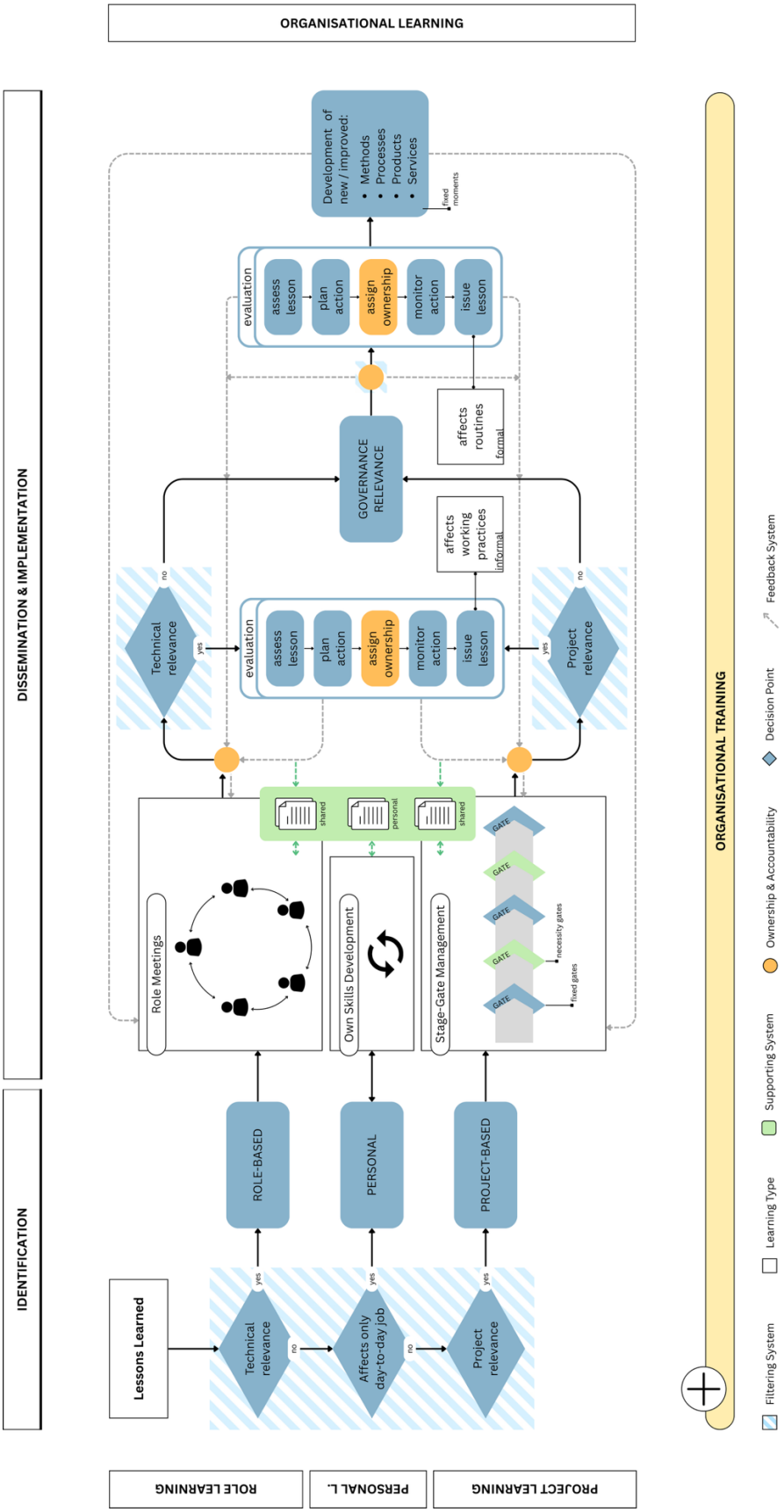
- What kind of behaviours, tools, or routines would be part of it?
- What would make it valuable across different projects and teams?

10. Imagine now to be in the board or higher up management in your organisation, what would you do? (How would you try to make lessons learned an effective practice in your organisation?)

X. Wrap-up

- Is there anything we haven't touched on that you think is important about how your organisation learns from projects?
- Would it be okay if I follow up with you in case I need clarification on something later on?

Appendix 2 – Framework



Appendix 3 – Questionnaire Validation

Validation Questionnaire – Master Thesis

Title of Thesis
Beyond Documentation: Lessons Learned as Socio-Technical Systems in Construction Client Organisations

Researcher
Caplli Mattia, MSc Student CME, TU Delft

Introduction
This questionnaire aims to validate the conclusions and framework developed in this research. The framework proposes a socio-technical approach to Lessons Learned (LL) practices, integrating processes, behavioural dynamics, and governance mechanisms.

You are asked to evaluate the results along three dimensions:

1. **Completeness** – Does the research capture the essential aspects of LL?
2. **Effectiveness** – Does the research improve understanding of LL practices?
3. **Feasibility / Applicability** – Are the framework and tailoring process usable for client organisations?

Please rate each statement on a scale from **1 (strongly disagree) to 5 (strongly agree)**, and provide remarks where relevant.

* Indicates required question

Section 1 – **Completeness**

1.1. The framework captures the main factors influencing LL practices. *

- [ ] 1 (strongly disagree)
- [ ] 2 (disagree)
- [ ] 3 (neutral)
- [ ] 4 (agree)
- [ ] 5 (strongly agree)

1.2. The transition from theoretical and empirical research to the conclusions and framework is logical and convincing. *

- [ ] 1 (strongly disagree)
- [ ] 2 (disagree)
- [ ] 3 (neutral)
- [ ] 4 (agree)
- [ ] 5 (strongly agree)

1.3. The analysis and framework capture the organisational dynamics (formal and informal) that shape LL in client organisations. *

- [ ] 1 (strongly disagree)
- [ ] 2 (disagree)
- [ ] 3 (neutral)
- [ ] 4 (agree)
- [ ] 5 (strongly agree)

1.4. Do you consider any important elements or dynamics missing from the analysis and framework?

Your answer

Section 2 – **Effectiveness**

2.1. The framework improves the understanding of how LL operates within client organisations. *

- [ ] 1 (strongly disagree)
- [ ] 2 (disagree)
- [ ] 3 (neutral)
- [ ] 4 (agree)
- [ ] 5 (strongly agree)

2.2. The analysis and framework adequately explain the challenges of LL and how they can be addressed. *

- [ ] 1 (strongly disagree)
- [ ] 2 (disagree)
- [ ] 3 (neutral)
- [ ] 4 (agree)
- [ ] 5 (strongly agree)

2.3. The analysis and framework clarify why LL practices often fail to move beyond documentation in client organisations. *

- [ ] 1 (strongly disagree)
- [ ] 2 (disagree)
- [ ] 3 (neutral)
- [ ] 4 (agree)
- [ ] 5 (strongly agree)

2.4. Do you see any areas where the analysis and framework fall short in contributing to a better understanding of LL practices compared to existing knowledge?

Your answer

Section 3 – **Feasibility / Applicability**

3.1. The framework is feasible to implement in client organisations (given their structures, roles, and governance systems). *

- [ ] 1 (strongly disagree)
- [ ] 2 (disagree)
- [ ] 3 (neutral)
- [ ] 4 (agree)
- [ ] 5 (strongly agree)

3.2. The proposed tailoring approach (relating the general framework to formal and informal practices in specific client organisations) is a useful way to generate practical recommendations. *

- [ ] 1 (strongly disagree)
- [ ] 2 (disagree)
- [ ] 3 (neutral)
- [ ] 4 (agree)
- [ ] 5 (strongly agree)

3.3. The framework could support decision-making on where client organisations should prioritise their LL improvement efforts. *

- [ ] 1 (strongly disagree)
- [ ] 2 (disagree)
- [ ] 3 (neutral)
- [ ] 4 (agree)
- [ ] 5 (strongly agree)

3.4. Do you see any challenges or opportunities do you foresee in applying the framework and tailoring process in practice?

Your answer

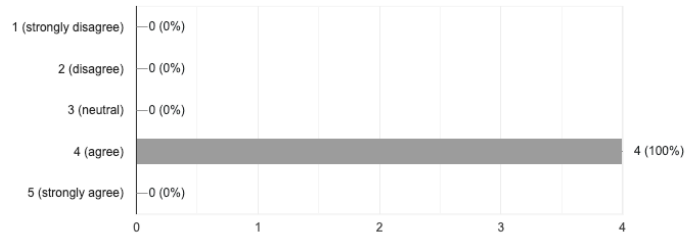
Appendix 4 – Results Validation

Section 1 – Completeness

1.1. The framework captures the main factors influencing LL practices.

Copy chart

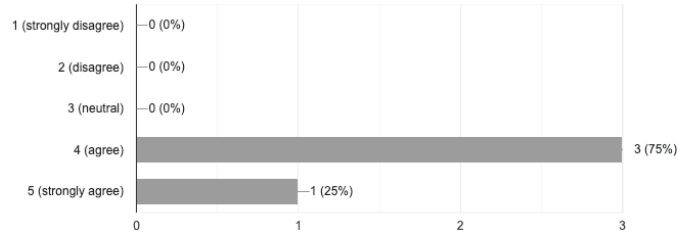
4 responses



1.2. The transition from theoretical and empirical research to the conclusions and framework is logical and convincing.

Copy chart

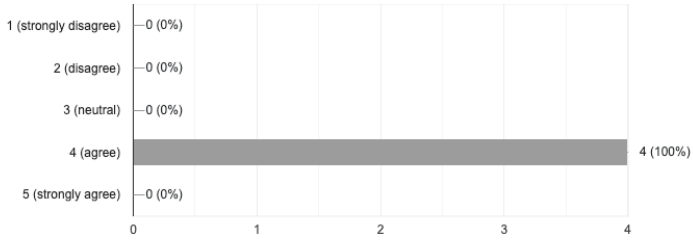
4 responses



1.3. The analysis and framework capture the organisational dynamics (formal and informal) that shape LL in client organisations.

Copy chart

4 responses



1.4. Do you consider any important elements or dynamics missing from the analysis and framework?

4 responses

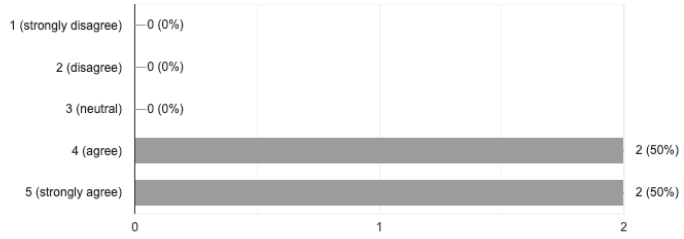
- The process of maintaining and usings LL after identifying and formalizing them is less visible (might be out of scope for the research, nevertheless it's very interesting for real life application of LL)
- The individual/people aspects and how they play a role in the effectiveness of applying LL practices.
- The framework stresses culture, but it does not fully integrate structured change management.
- No

Section 2 – Effectiveness

2.1. The framework improves the understanding of how LL operates within client organisations.

Copy chart

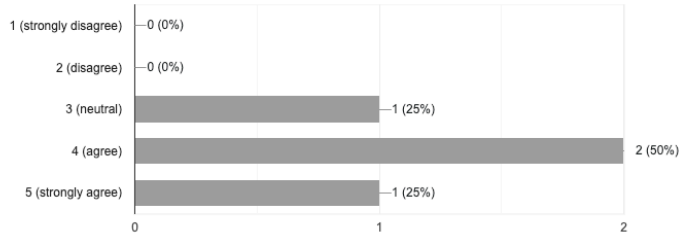
4 responses



2.2. The analysis and framework adequately explain the challenges of LL and how they can be addressed.

Copy chart

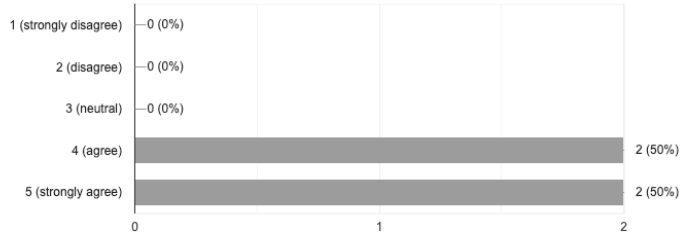
4 responses



2.3. The analysis and framework clarify why LL practices often fail to move beyond documentation in client organisations.

Copy chart

4 responses



2.4. Do you see any areas where the analysis and framework fall short in contributing to a better understanding of LL practices compared to existing knowledge?

4 responses

From my understanding the framework does not incorporatie different characteristics of organizations like size and culture. Again, this might be out of scope for the research.

The findings do not mention anything regarding the priority/importance perceived by people regarding LL. The empirical research does mention that the attention to LL suffers under time pressure. Has the impact of knowing the benefits as an individual and stressing the importance as an organisation of LL been considered? Generally everyone can agree that it is important to learn from mistakes, but making it tangible could potentially give LL the boost in attention that is required for it to be effective.

While the framework adds value by bridging behavioural and process perspectives, it falls short in showing clear benchmarks against existing LL models and offers limited guidance on practical implementation across wider stakeholder contexts.

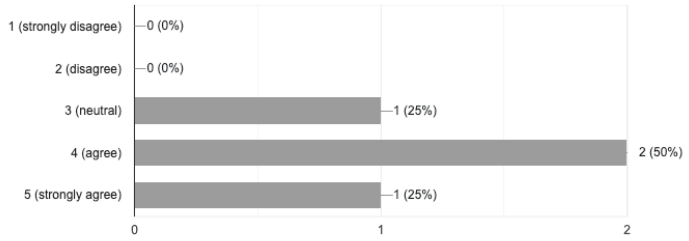
No

Section 3 – Feasibility / Applicability

3.1. The framework is feasible to implement in client organisations (given their structures, roles, and governance systems).

Copy chart

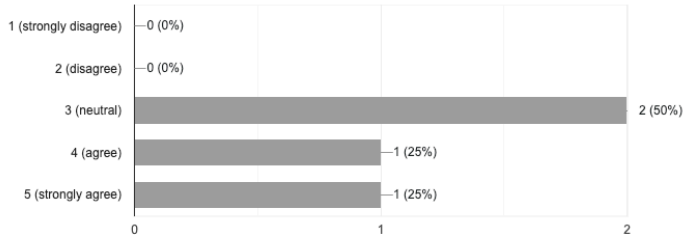
4 responses



3.2. The proposed tailoring approach (relating the general framework to formal and informal practices in specific client organisations) is a useful way to generate practical recommendations.

Copy chart

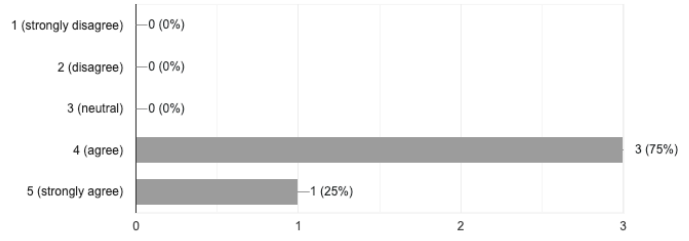
4 responses



3.3. The framework could support decision-making on where client organisations should prioritise their LL improvement efforts.

Copy chart

4 responses



3.4. Do you see any challenges or opportunities do you foresee in applying the framework and tailoring process in practice?

4 responses

No, frameworks seems applicable and reasonable. Only challenge could be availibilty of funds and assets within an organization to apply the framework

The framework provides a good insight into the theoretical side of LL. An area for improvement from my point of view would be to provide practical tools/solutions that can directly be applied once the framework has been applied and the LL priority has been identified.

The main challenge is avoiding a compliance mindset and overcoming cultural resistance, while the opportunity lies in using training, technology, and accountability to make LL truly embedded in practice.

An opportunity for applying the framework is to measure impact such as: repeated issues avoided by lessons learned or time/cost savings from applying lessons learned.